Urban Poverty and Transport: The Case of Mumbai*

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I. Introduction

This paper reports work carried out by the World Bank to analyze the linkages between urban poverty and transport in Mumbai, India. The analysis draws on a household survey and focus group discussions that were carried out between August 2003 and February 2004. Section I provides the background and motivation for the study and discusses the questions addressed. Section II discusses the target population for the survey, questionnaire development, sample selection and survey administration. Sections III and IV discuss our findings. Section V summarizes our conclusions and suggests the areas in which future research is needed.

A. Background and Motivation

The urban poor in developing countries face enormous challenges in their daily lives. Many live in crowded slums within cities or in more remote peri-urban areas with limited access to jobs and social services. Problems of access can be linked to failures of the economy, lack of equity in the provision of services, and poor or unaffordable transport links to enable mobility. This contributes to low living standards, social fragmentation and problems of social exclusion.

Relatively little is known about the transport behavior of the urban poor in developing countries, their residential patterns, and how these are affected by transport policy. The research that exists characterizes the transport patterns of the poor as a complex tradeoff among residential location, travel distance and travel mode, in an attempt to minimize the social exclusion associated with low earnings potential (World Bank, 2002). In accessible parts of the city, the poor can often afford only precarious sites with insecure tenure. Conversely, affordable sites that may have more secure tenure are more likely to be located in the less accessible periphery of the city and involve higher commuting times and costs (UNHABITAT, 2003).

Empirical studies in individual cities show evidence of differences in the composition, number, and mode of trips between poor and non-poor, but the dynamics of these differences are not well explored (Thompson, 1993; Godard and Olvera, 2000). The urban poor make fewer trips per capita than the non-poor, but the differences are not extreme. The travel purposes of the poor are more limited in scope, with journeys to work, education and shopping dominating. Transport mode differs substantially, with the urban poor relying heavily on walking, and the non-poor making many more motorized trips.

The goal of this study is to better understand the demand for transport services by the poor, the factors affecting this demand, and the inter-linkages between transport decisions and other vital decisions such as where to live and work. Understanding these linkages should ultimately help to design transport policies that will help the poor. The study is not intended to be a tool for transportation planning purposes per se, and is not based on a large enough to provide information on trip patterns at a fine level of spatial detail (e.g., at the level of transportation analysis zones). The Mumbai Metropolitan Regional Development Authority Comprehensive Transportation Study, to be completed in 2005, is designed for this purpose.

We have addressed these goals by conducting a survey of 5,000 randomly sampled households in Mumbai, India. The goals of the project were:

1. To document where in Mumbai the poor and the non-poor live and work, and to characterize their travel patterns;
2. To study the travel behavior of the poor and the non-poor as a function of residential location, employment location, the time and money costs of travel and the quality of transit service (as perceived by the traveler);
3. To estimate household models of residential and employment location choice that quantify the role of access to transit (as well as other factors) in location choice.

B. Questions Addressed by the Paper

In this paper we focus on the first goal of the project: the description of residential and work locations and travel patterns of households in Mumbai. The key questions addressed are as follows:

• What is the spatial distribution of households by income (consumption) in the Greater Mumbai Region? How segregated are various income groups?

We find that there is considerable heterogeneity in income across residential locations in Mumbai—in many areas of the city the poor live next to the rich and to the middle class. It is however, the case that a larger fraction of the poor live in the eastern suburbs of Mumbai (zones 5 and 6 of the city) than do the non-poor. This area is not as well served by public transit and is not where the majority of jobs in Mumbai are located.

• How does the distance between residence and employment vary (a) by income group; (b) by location of residence?

Regardless of where they live, the poor, on average, commute shorter distances than the non-poor, implying that they work closer to home than non-poor households. The fact that the poor work closer to home than the non-poor could be due to commuting costs: rail and bus fares are a higher percent of income for the poor than the non-poor. It is also the case that the poor live farther away from train stations than the middle class,

possibly due to higher land prices near rail lines, which implies that they have higher out-of-vehicle travel times.

- How do the number of trips made and modal split vary among income groups? What is the demand for trips other than trips to work? How do the poor utilize transport for daily errands such as shopping?

As expected, poor households make fewer trips than wealthier households and rely more on walking than on motorized transit regardless of where in Mumbai they live. This is true both for the journey to work (66% of commuters in poor households either walk or bicycle to work v. 45% for all households) and for non-work trips. Over 30% of poor households do, however, use rail and bus for commuting, and those that do spend a significant fraction of their income on transportation—17% in poor households where the main earner commutes by train and 19% in poor households where he or she commutes by bus.

- How does access to basic social services such as education and healthcare vary across location and income? Is it the case that the access is the major problem for the poor to use the service?

About 90% of the students from the poor households live within 30 minutes walking distance from their schools. Consequently, school trips are largely made on foot (83%). School attendance varies significantly across zones but access to school doesn't seem to account for much of this variation.

Although most people—regardless of income—have some form of healthcare provider within a 15 minute walk from their homes, the poor travel more to obtain healthcare because they are farther away from relatively low cost service at municipal hospitals.

- Does the cost of public transit result in the lower mobility of the poor?

Is the reason that the poor travel shorter distances and less often than the non-poor because of the high time and money costs of travel or is it because they have chosen for other reasons to work near where they live? This has clear implications for the impact of transit policies on travel by the poor. We will investigate this question more thoroughly in subsequent papers.

- Does low mobility imply that the poor are worse off than if they traveled more?

A key question for policy is whether the poor are necessarily disadvantaged by where they live and by the fact that they rely less on motorized transport than the non-poor. Household welfare depends on what household members earn, on the cost and quality of housing they consume, and on the cost of transportation. Whether poor households living in the suburbs of Mumbai are worse off than poor households who are

more centrally located depends on the level of wages and rents in the suburbs versus the city center.

To provide some insights into the tradeoff between wages, rents and transport costs, we use our survey data in section IV to describe how wages and rents vary spatially in Mumbai. This gives us a rough idea whether lower rents in more remote locations compensate for lower wages. It also enables us to ask whether, by lowering the cost of transportation, one could increase household welfare by enabling a worker who lives in the suburbs to travel to a job in the center city. The results in section IV of the paper are, however, merely suggestive. Evaluating the welfare effects of a reduction in the cost of transit, including its impacts on choice of where to live and work, requires estimating models of housing and job location choice, together with models of commute mode choice. This is a subject for further research.

II. Study Site, Questionnaire Development, and Data Collection

A. Mumbai

The target population of our survey are households in the Greater Mumbai Region (GMR), which constitutes the core of the Mumbai metropolitan area. The GMR, with a population of 11.9 million people in 2001, occupies 468 sq. km. This makes Mumbai one of the most densely populated cities in the world. During the decade 1991-2001 the population of the GMR grew at a rate of approximately 1.8 percent annually—less than the national average. This reflects a declining rate of migration into the city and the more rapid growth of the Mumbai metropolitan area. The Mumbai metropolitan area is one of the world's largest with a population in 2001 of 18 million. The city faces enormous challenges with shortages of land, housing, infrastructure, and social services that have not kept up with the growing demands of the city. An estimated 50 percent of the city's population lives in slums, many located along railway tracks. Some of Asia's largest slums, including Dharavi, with a population of over one million, are located in Mumbai.

Mumbai is located on the Arabian Sea. The GMR extends 42 km north to south and has a maximum width of 17 km. The Municipal Corporation of Greater Mumbai has divided the city into 6 zones, each with distinctive characteristics. The southern tip of the city (Zone 1) is the traditional city center. Zone 3 is a newly developed commercial and employment center, and Zones 4, 5 and 6, each served by a different railway line, constitute the suburban area. While the majority of jobs are concentrated in Zones 1-3, there has been some dispersion in the distribution of jobs to the suburbs.

Figure 1 Map of Zones
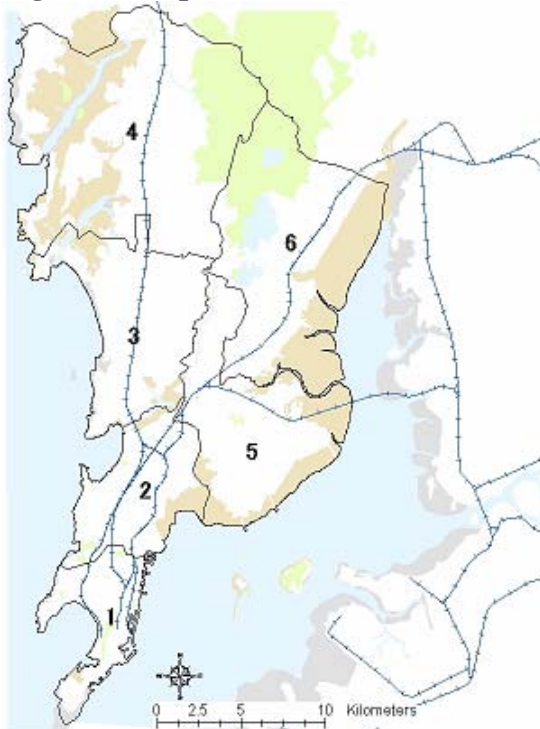
Urban development and urban transport are managed by the Mumbai Metropolitan Regional Development Authority (MMRDA) a regional planning agency under the Department of Urban Development. The urban transport network is linear along the peninsula. There are two national rail lines serving Mumbai (the Western Railway (WR) and Central Railway (CR))[1] which also provide suburban commuter rail services. Three urban arterial roads run through crowded urban areas, also running linearly. Cross-road links are less developed.

B. Household Questionnaire Design and Administration

Our household questionnaire (see Appendix A) was administered to an adult respondent in each household to elicit the following information:

- Household demographic composition and educational achievement
- Household geographic location and housing characteristics
- Activities (employment, schooling) undertaken by each household member
- Household assets and sources of income
- Availability and cost of various transport modes
- Assessment of quality of transit services and barriers to use of transit
- Distances to educational, health, shopping facilities; availability and cost (both time and money) of transit to these facilities; other factors affecting usage
- Description of typical work trips taken by the two most important earners in the household; description of typical school trips taken by children in the household

In addition, a travel diary (see Appendix A) was filled out by (a) the main wage earner in each household; (b) a randomly chosen adult over 21; and (c) a randomly chosen person between the ages of 16 and 21. The travel diary requested the following information for all trips taken on the day following the household survey: destination of trip, purpose of trip, time of day trip originates, distance traveled, mode(s) chosen, duration of trip, out-of-pocket cost.

The questionnaire was developed on the basis of focus group discussions, one-on-one interviews and two pre-tests, each consisting of 100 households. The survey was administered beginning in October of 2003 by a local survey research firm, MaRS (Monitoring and Research Systems) Ltd. using a team of 17 enumerators and 3 supervisors. Data collection ended in February 2004. Enumerators were trained by the authors of this paper and by employees of Cal-2-Cal Corporation, the firm that programmed the questionnaire and travel diaries on PDAs. The PDAs were equipped with portable Global Positioning System (GPS) units. The enumerators carried these devices to the field and recorded responses on site. The GPS units stamped each survey response with the time of the survey and with geo-coded information that validated the

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[1] The Harbor Line which connects the GMR to the Navi Mumbai area is considered a part of the Central Railway.

survey location. Extensive consistency checks were programmed into the software to minimize data collection errors and ensure a high level of data quality. (A detailed description of our survey administration protocols appears in Appendix B.)

C. Sample Selection

The Mumbai survey was designed to be representative of the Greater Mumbai Region (GMR), hence the sampling universe did not cover the entire Mumbai metropolitan area, which is considerably larger than the GMR.[2] All households in the city were part of the sampling universe with the exception of residents of military cantonments and institutional populations (e.g., prisons). The target sample size was 5,000 households.

To select the sample we obtained household listings from the March 2001 Census to use as a sampling frame. The GMR is divided into 6 zones, which are further subdivided into 88 sections. Each section is, in turn, comprised of Census Enumeration Blocks (CEBs) containing approximately 600 households. To ensure that all parts of the city were covered by the sample, we chose sample fractions in each section in proportion to the number of households living in that section. Within each section CEBs were randomly selected with a predetermined number of households in each CEB. (Figure 2 below provides location of the sample households and the section boundaries.) Approximately 1,000 CEBs were sampled, with (on average) 5 houses chosen in each CEB. The selection of the households to be interviewed within a CEB was determined by choosing an arbitrary starting point in the CEB and sampling every 10th household.

The respondent within each household was either the head of household or the head's spouse. Enumerators were instructed to alternate male and female respondents within an enumeration block to assure an equal number of male and female respondents.

III. Description of Residential and Work Locations and Travel Patterns

In this section we describe the characteristics of our sample households. The goal is to present the stylized facts about where households live and work, and about their travel patterns. Throughout the section we highlight two themes: how travel demand in Mumbai varies by residential location (especially the central city v. the suburbs), and how it differs between poor and non-poor households. We begin by describing the socio-demographic characteristics of households and household heads.

A. Household Characteristics

Tables C-1 through C-6 in Appendix C describe the socio-demographic characteristics of our sample households and compare them to the characteristics of households in the 55th National Sample Survey. The profile of households in Mumbai, as defined in our sample, shows average household size to be 4.4, with three-quarters of our

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[2] According to the 2001 census, the GMR has a total population of 11.9 million, compared to 17.8 million for the metropolitan area.

households having 3, 4 or 5 members.[3] Ninety-five percent of households are male-headed, and the average household head is 40 years old. Approximately 10% of our household heads have a primary education or less, and 18 percent have received a university degree or higher. In terms of occupation, 25% of household heads are employed as skilled workers, 18% as unskilled workers, 12% as clerical/sales workers and 11% as shop owners. The majority (75%) of households are Hindu, while 17% are Muslim.

1. A Profile of the Poor

How do the socio-demographic characteristics of poor households differ from those of non-poor households? Income poverty is typically defined in terms of consumption, due in part to difficulties in measuring income in developing countries. Initially our survey included an extensive consumption module as well as information on income. Respondents were asked to report household income in a one of a series of intervals, as well as the income of each of the two main earners in the family (also in intervals).[4] Responses to the consumption module from the first 500 households who completed the survey were used to examine the correlation between household consumption and household income. Because the correlation between consumption expenditure and income was high (0.69), and because household income was explained well by the income of the two main earners in the household, we decided to rely on household income as a measure of welfare. This allowed us to drop the lengthy consumption module from the survey, thereby shortening the length of the interview and reducing respondent fatigue.

In what follows we classify households into one of five income categories, corresponding to self-reported monthly income (in Rs.): under 5,000; 5,000-7,500; 7,500-10,000; 10,000-20,000; over 20,000. Twenty-seven percent of households fall in the first income category; 28% in the second, 22% in the third, 18% in the fourth and 6% in last category.

For the purposes of poverty analysis we focus on the first income group, with household income below 5000 rupees per month. We acknowledge that this is above the official poverty line for urban Maharashtra of 594 Rs. per person per month; however,

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[3] As discussed in Appendix C, there are some differences between our households and those in the NSS due to differences in the populations sampled. The NSS covers "inmates (including residential staff) of a hostel, mess, hotel, boarding and lodging house, etc.," who are likely to constitute a single member household. It also covers "households residing in open space, roadside shelter, under a bridge etc., more or less regularly in the same place." Both of these categories are not covered in our survey. The NSS definition of a household is also slightly different from ours, as it includes resident employees, domestic servants and paying guests.

[4] The household income categories in the survey instruments are: less than Rs. 5,000, Rs. 5,001-7,500, Rs. 7,501-10,000, Rs. 10,001-15,000, Rs. 15,001-20,000, Rs. 20,001-25000, Rs. 25,001-50000, Rs 50,001-75,000, and more than Rs. 75,000. The personal income categories are: less than Rs. 1,000, Rs. 1,001-5,000, Rs. 5,001-10,000, Rs. 10,001-25,000 and more than Rs. 25,000.

5000 Rs. per month is the lowest income category in the survey. The characteristics of poor households in Mumbai are, not surprisingly, quite different from those of non-poor households. (See Table 1.) For poor households, the average age of the household head is slightly younger, a larger proportion of poor households are female headed, educational attainment is lower, and a larger fraction of heads are employed as unskilled workers.

Table 1. Selected Household Characteristics in Mumbai, by Income Group

Characteristic	Income Group (in rupees per month)					
	< 5 k	5–7.5k	7.5–10k	10–20 k	>20 k	Avg. All HHs
Household size (mean)	4	4.4	4.6	4.6	4.4	4.4
Age of Head (mean)	38.2	39.4	41.1	42.9	45	40.4
Female Head (%)	8.8	3	3.9	3.2	1.3	4.5
Education (%)						
Primary or less	20.6	10.8	7.2	2.0	0.3	10.4
College or above	4.0	7.9	17.0	39.2	66.5	18.0
Occupation (%)						
Unskilled	33.9	21.0	11.1	3.5	1.3	17.9
Housing Category (%)						
Squatter settlement	52.2	45.3	34.3	16.1	6.2	37.2
Chawls/Wadi	37.5	37.5	41.5	27.6	9.9	34.9
Cooperative Housing	5.2	9.6	17.1	47.6	78	21
Other	5.1	7.7	7.2	8.8	5.9	7.1
Housing Tenure (%)						
Less than 5 years	18.6	14.5	13.2	20.1	17.4	16.4
6-9 years	8.2	7.5	7.1	8.5	10.8	8
More than 10 years	34.5	35.3	34.7	31.3	46.6	35
Since birth	38.7	42.7	45	40.1	25.3	40.6
Within-household access to:						
Piped Water	48	64	75	92	99	69
Toilet	12	18	31	64	89	32
Kitchen	29	43	61	87	98	54

The poor are also more likely to live in squatter settlements and are less likely to have a piped water connection, toilet or kitchen within their homes than the non-poor. One way in which the poor do not differ much from the non-poor is in terms of the length of time they have lived in their current residence: 75% of the poor have lived in their current homes for at least 10 years. This is approximately the same percent for all income groups. What differs among income groups is the percent of households who have lived in their homes since birth. Thirty-nine percent of the poor have lived in their homes since birth. This figure is even higher for the Rs. 7,500-10,000 Group (45%), but is lower for the highest income group (25%).

2. *Spatial Distribution of Households by Income Group*

Where do households in different income groups live in Mumbai? Tables 2 and 3 show the distribution of households across zones, by income group. The most salient feature of the spatial distribution of households is its lack of pattern or segregation by income group. There is neither a large predominantly poor or rich area, nor does a large percent of a given income group live in a particular zone. There are, however, some discernable patterns: A greater percent of the poor live in Zones 5 and 6 than do other groups, especially higher income groups: 37% of the poor live in these zones v. 21% of the top income group and 23% of the next highest income group. Zone 2 has a larger proportion of middle income households than other zones, and Zone 1 a larger percent of households in the highest income category than other zones.

Table 2. Percentage Distribution of Household Incomes within Each Zone

| | **HH income** | | | | | |
Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Total
1	22.3	22.5	21.5	25.6	8.1	100
2	20.3	30.2	25.2	20.1	4.1	100
3	26.7	24.5	20.9	20.7	7.3	100
4	28.0	27.2	19.3	16.2	9.3	100
5	34.5	32.1	21.6	8.6	3.2	100
6	26.4	29.7	22.9	16.3	4.7	100
Average All Zones	26.5	27.7	21.9	17.8	6.2	100

Table 3. Percentage Distribution of Households Across Zones, by Income Category

| | **HH income** | | | | | |
Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Avg. All HHs
1	9.9	9.5	11.5	16.8	15.3	11.7
2	12.7	18.0	19.0	18.6	11.0	16.5
3	21.2	18.6	20.1	24.4	24.7	21.0
4	19.8	18.3	16.5	17.0	28.3	18.7
5	19.1	17.0	14.5	7.1	7.5	14.7
6	17.4	18.7	18.3	16.0	13.3	17.5
Total	100	100	100	100	100	100

This heterogeneity persists when the data are examined at a more disaggregate level. Figure 2 shows the actual location of our sample households. Each dot represents one enumeration block (i.e., 3-6 sampled households) and is color-coded to show the mean household income of the enumeration block. We can see that most parts of the city are quite heterogeneous in terms of income, with dots of different colors mixed with each other.

Figure 2 Location and Income of Sample Households
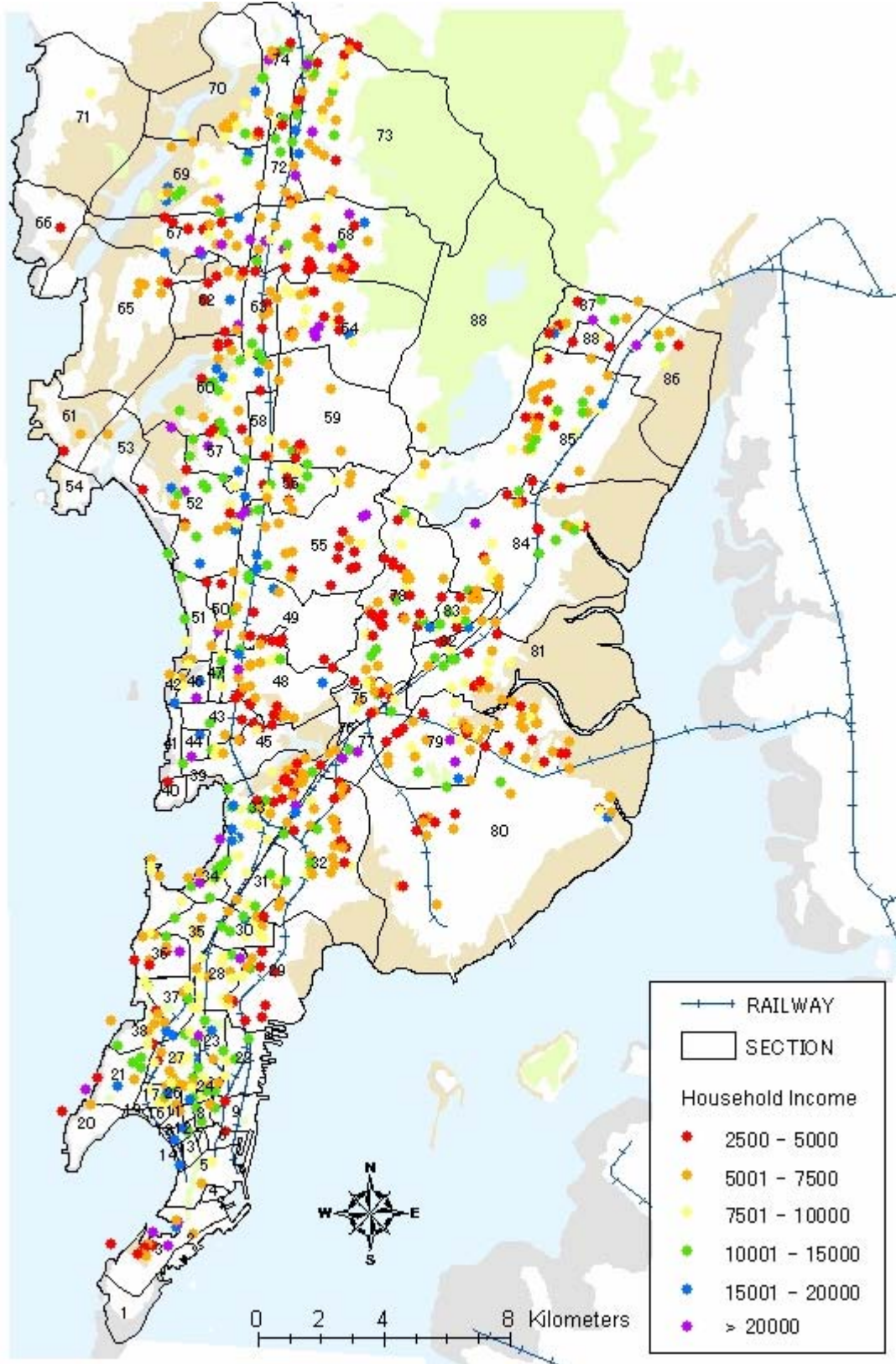
B. Commuting Patterns

In Mumbai, as in other cities, the journey to work constitutes the largest fraction of household trips in terms of distance traveled. This section describes the commuting behavior of the main earner and second most important earner in each household, based on questions about the earner's usual commute in the main household survey.[5]

Perhaps the most striking feature of commuting behavior in Mumbai is the distribution of commute distances (Figure 3). The commute distance with the highest frequency is only 1-2 km, and more than 40% of workers (50% of poor workers) are commuting less than 2 km. The distribution, however, has a long tail. Approximately 19% of all workers and 11% of poor workers commute more than 10 km. The mean one-way commute distance is 5.3 km for all workers and 3.9 km for the poor.

Figure 3. Distribution of One-Way Commute Distances
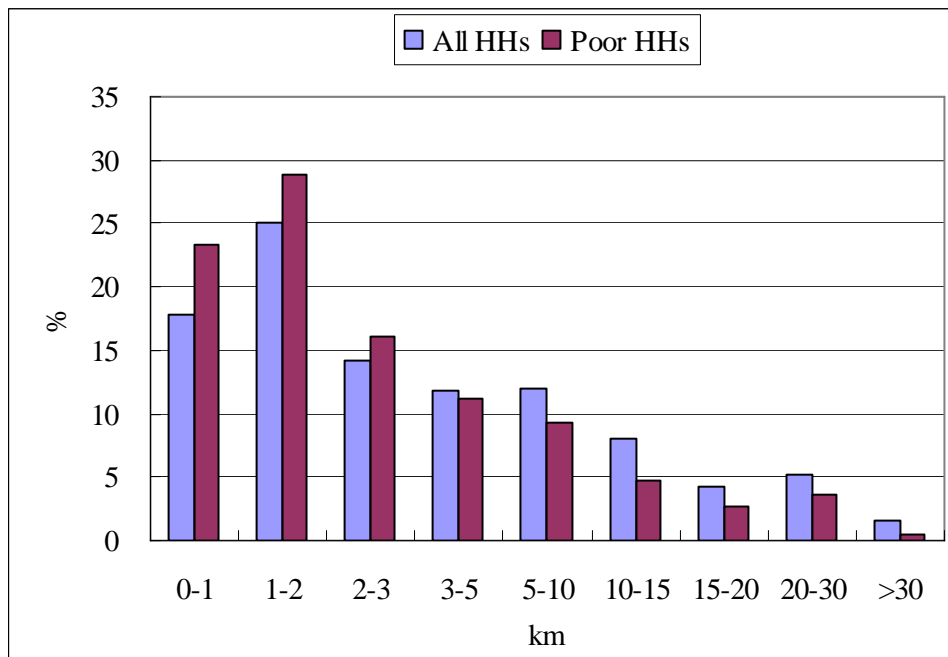
1. Commute Patterns by Zone and Income Group

What Figure 3 does not show are the significant differences in commuting patterns by area of the city. As shown in Table 4, approximately 85% of the workers who live in zones 1-3 also work in one of these zones. This accounts for the fact that average commutes in zones 1-3 are shorter than in zones 4-6. (See Table 5.) In contrast, a

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[5] The household questionnaire collected information about the two most important earners in each household, including their earnings, place of work and usual commute pattern. Table 4, which shows where people who live in each zone work, is based on all 6,492 workers in the survey. Table 5, which shows one-way commute distances, is based on the subset of workers who commute to a job in the GMR. It excludes persons who work at home or who commute to a work place outside the GMR, whose exact location was not obtained.

significant fraction of workers who live in zones 4 and 6 commute to zones 1-3 (36% and 29%, respectively), which raises the average commute distance in these zones. Zone 5 is somewhat different: 55% of persons who live in zone 5 also work there; however, it is still true that 24% of workers in this zone commute to zones 1-3.

Table 4. Percentage Distribution of Workers Across Job Locations, by Zone of Residence

Home	At home	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Outside of GMR	Not fixed[6]
		Work location							
Zone 1	8.5	76.0	5.4	4.1	0.9	1.1	2.9	1.2	0.1
Zone 2	6.2	20.3	60.4	6.1	1.6	1.5	1.0	2.8	0.0
Zone 3	5.0	6.7	5.0	73.1	4.2	2.0	0.7	0.3	3.0
Zone 4	8.8	10.2	4.3	21.2	47.8	0.5	0.8	3.1	3.2
Zone 5	2.1	9.0	7.8	6.7	0.9	54.6	6.7	4.7	7.7
Zone 6	4.4	13.3	8.1	7.7	15.1	3.6	37.6	5.4	4.9
Average All Zones	5.8	19.5	15.1	22.3	13.4	9.3	8.5	2.9	3.2

There are also significant differences in commuting patterns by income. On average, higher income workers travel significantly longer distances and spend a longer time commuting irrespective of place of residence (Tables 5, 6). The difference in commuting patterns between the rich and the poor is, however, greatest in the suburbs. If one looks at Table 4 (Work Location by Residential Location) broken down by income group (Appendix D, Table D-1), the percent of workers who work in the zone in which they live varies little by income group in zone 1 and 3. In zone 4, however, 55% of the poor living in zone 4 work in the zone, whereas only 30% of the highest income group do. The corresponding figures for zone 6 are 49% v. 16%. The fact that a higher percent of the poor living in the suburbs work in the suburbs (rather than commuting to zones 1-3) may be due to the cost of commuting. We return to this point below.

Table 5. Mean One-Way Commute Distance by Zone and Income (km)

Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Avg. All HHs
1	2.3	2.7	3.5	3.7	4.6	3.3
2	2.8	3.5	4.4	4.5	5.7	4.0
3	2.8	3.5	4.7	5.1	5.0	4.1
4	4.8	6.7	6.3	9.5	11.3	7.1
5	3.7	4.5	5.8	4.5	6.0	4.6
6	6.2	7.7	8.8	8.9	10.4	8.0
Average All Zones	3.9	4.9	5.7	6.1	7.7	5.3

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[6] Those who don't work in the same location every day, such as taxi drivers, street vendors, etc.

Table 6. Mean One-Way Commute Time by Zone & Income (minutes)

Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Avg. All HHs
1	16.1	14.9	19.4	19.0	25.0	18.1
2	17.3	19.5	23.2	24.9	25.6	21.7
3	18.0	20.4	22.1	23.8	26.3	21.4
4	23.7	26.9	26.8	33.9	48.6	29.7
5	18.2	23.1	31.1	21.0	29.4	23.5
6	26.2	28.1	33.5	30.6	34.8	29.8
Avg. All Zones	20.4	22.9	26.3	26.0	34.0	24.5

2. Mode Choice

In a city in which 57% of works trips are 3 km or less, it is not surprising that over 40% of commuters walk to work. Table 7 describes the 'main mode' used on a typical commute trip, as described in our household survey. The main mode is defined to be the mode that takes the longest time, with the exception of "on foot" and "bicycle," which are counted as the main mode only if they are the only mode used on the trip. Table 7 indicates that 44% of commuters walk to work, 23% rely on rail as their main mode, while 16% rely on bus as a main mode.[7] The modal shares for private vehicles are much smaller—approximately 3% each for bicycle and car and 8.5% for two-wheelers.[8] The respective mode shares are somewhat different for the poorest income group: 61% of the poor walk to work, 6% ride a bicycle, 16% take the train and 15% ride the bus. Because, for most income groups, the shares of bicycle, auto-rickshaw and ride-sharing (other's car) are small, we concentrate in the analysis that follows on the four major modes plus private car, whose share is overall small but which plays an important roll in some income categories.

The choice of mode differs considerably by commute distance and across income groups (Table 8).[9] For all income groups, the modal share for walking decreases with commute distance, whereas the share for rail in general increases with commute distance. The modal share for bus is highest for commutes between 3 and 10 km. For motorcycles, the share is highest for trips of 5 km or less. The relationship between income and mode choice is what one would expect: The poor rely heavily on walking (61% for commuters in households earning less than Rs. 5000) but take rail for long distances (5 km or more) and bus for intermediate distances (3-10 km). Overall, the modal shares for rail and bus

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[7] In Table 12, these shares, based on the travel diaries are, respectively, 46% walking, 21% rail and 15% bus.

[8] The shares based on the travel diaries are 3.5% for bicycle, 3.2% for own car and 8.6% for own two-wheeler.

[9] Commute distance is calculated as the distance between the worker's house, whose geographic coordinates are known, and his approximate work location. The work location is approximated by the centroid of the intersection of the section and pin code in which the job is located.

are 16% and 15% for the poor; however, these shares are higher in the suburbs than in zones 1-3 (see Table 9).

Table 7. Main Mode to Work

	Total		Income <5k	
	Freq.	**Percent**	**Freq.**	**Percent**
On foot	2,447	43.8	727	60.8
Bicycle	173	3.1	73	6.1
Train	1,267	22.7	192	16.1
Public Bus	902	16.1	173	14.5
Auto-Rickshaw	100	1.8	15	1.3
Taxi	8	0.1	0	0.0
Own Two-Wheeler	477	8.5	8	0.7
Own Car	148	2.7	0	0.0
Other's car	8	0.1	2	0.2
Other	57	1.0	5	0.4
Total	5,594	100.0	1,195	100.0

As household income goes up, the modal shares of bus and motorcycle increase for short to medium commutes, while the share of trips made on foot declines. Rail remains the choice for long distance commutes, especially for households with incomes between Rs. 7,500 and 20,000 per month: One-quarter of commuters in this income range report rail as their main commute mode. Indeed, it is commuters in the Rs. 7,500-20,000 income range who are the largest users of public transit. In the highest income category (Rs. 20,000 or more), the share of walking declines to 15% and is replaced by motorcycles and cars. For commuters in the highest income category, the modal shares are 20% for two-wheeler and 24% for car.

Table 8. Main Mode to Work by Commute Distance and Income
(% within distance/income category who take each mode)

	Distance	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg.
Walk	0-1km	84.6	80.1	83.2	61.1	40.6	77.4
	1-2km	84.6	80.3	68.1	60.2	36.7	72.2
	2-3km	72.4	68.1	60.0	36.0	26.9	58.3
	3-5km	36.6	29.8	20.5	15.1	6.0	24.0
	5-10km	9.9	6.3	1.7	0.0	1.7	4.0
	10-15km	0.0	0.0	5.1	0.9	0.0	1.5
	Dist. Avg.	60.8	50.2	40.7	30.5	15.2	43.8
Rail	0-1km	0.7	0.9	0.5	1.7	0.0	0.9
	1-2km	0.3	0.5	3.6	2.2	1.3	1.6
	2-3km	1.6	3.0	5.6	5.0	3.8	3.6
	3-5km	9.0	13.5	8.1	7.2	8.0	9.5
	5-10km	51.4	42.2	41.6	41.0	11.7	40.6
	10-15km	69.6	82.4	72.0	61.5	26.0	66.8
	15-20km	96.9	89.6	91.8	87.3	50.0	86.0
	20-30km	95.3	96.2	98.4	96.1	81.3	94.9
	>30km	100.0	100.0	100.0	96.0	100.0	98.9
	Dist. Avg.	16.1	22.8	26.4	26.0	20.8	22.7
Bus	0-1km	5.7	7.5	4.7	6.3	3.1	6.1
	1-2km	7.2	6.8	10.5	9.7	6.3	8.3
	2-3km	17.2	15.9	20.0	21.1	15.4	18.1
	3-5km	37.3	42.7	46.0	30.9	14.0	37.8
	5-10km	30.6	40.6	38.7	35.3	26.7	36.1
	10-15km	23.2	12.6	12.7	18.3	22.0	16.4
	15-20km	3.1	6.3	4.1	3.6	3.6	4.2
	20-30km	2.3	0.0	0.0	1.3	0.0	0.7
	Dist. Avg.	14.5	16.5	18.3	16.3	12.4	16.2
Motor Cycle	0-1km	0.4	2.8	7.4	21.7	28.1	7.1
	1-2km	0.6	3.7	11.7	19.3	26.6	9.1
	2-3km	0.0	4.7	10.0	26.7	21.2	10.2
	3-5km	1.5	4.5	15.5	28.8	36.0	14.0
	5-10km	1.8	3.6	13.3	12.2	20.0	9.0
	10-15km	1.8	3.4	5.1	11.0	8.0	6.0
	15-20km	0.0	2.1	4.1	3.6	7.1	3.4
	20-30km	0.0	2.5	0.0	2.6	12.5	2.7
	Dist. Avg.	0.7	3.6	9.8	17.9	20.4	8.5
Car	0-1km	0.0	0.6	0.5	1.7	15.6	1.1
	1-2km	0.0	0.0	0.3	3.3	21.5	1.9
	2-3km	0.0	0.0	0.0	3.7	25.0	2.4
	3-5km	0.0	0.6	0.0	9.4	26.0	4.1
	5-10km	0.0	0.0	0.0	7.2	35.0	4.6
	10-15km	0.0	0.0	0.0	1.8	32.0	4.0
	15-20km	0.0	0.0	0.0	3.6	35.7	5.1
	20-30km	0.0	0.0	0.0	0.0	6.3	0.7
	>30km	0.0	0.0	0.0	4.0	0.0	1.1
	Dist. Avg.	0.0	0.2	0.2	4.0	24.4	2.6

Table 9. Main Mode to Work by Residential Location and Income

	Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg.
Walk	1	64.5	56.2	38.6	27.5	5.2	41.2
	2	55.6	48.5	37.7	28.8	14.8	40.2
	3	62.2	56.1	47.2	31.3	13.3	46.6
	4	59.0	46.3	46.6	32.5	15.9	43.4
	5	66.8	53.8	38.1	34.2	20.7	50.5
	6	55.7	42.3	33.9	30.5	24.1	39.9
	Zone Average	60.7	50.0	40.6	30.4	15.1	43.6
Rail	1	9.9	11.1	19.3	14.7	10.3	13.6
	2	13.1	23.2	25.7	27.4	16.7	22.9
	3	11.0	16.7	23.0	19.5	5.6	16.6
	4	17.6	27.4	24.0	39.0	35.4	27.5
	5	17.0	20.0	26.8	19.7	13.8	20.6
	6	25.1	32.1	37.1	33.2	33.3	32.1
	Zone Average	16.0	22.7	26.3	25.8	20.6	22.6
Bus	1	16.5	21.0	18.6	12.7	8.6	16.2
	2	20.9	16.9	18.7	23.0	14.8	19.3
	3	15.7	14.6	15.1	13.7	11.1	14.5
	4	10.2	13.2	17.6	12.5	13.3	13.3
	5	12.6	18.5	24.7	21.1	10.3	18.3
	6	13.8	16.7	15.8	17.1	14.8	15.9
	Zone Average	14.4	16.5	18.2	16.2	12.3	16.1
Motor Cycle	1	0.8	4.9	20.7	36.3	29.3	18.8
	2	0.0	4.0	12.1	19.0	18.5	9.9
	3	1.2	4.8	11.9	17.6	22.2	9.8
	4	1.2	3.6	4.5	7.0	15.9	5.2
	5	0.0	1.9	5.2	18.4	31.0	4.9
	6	0.5	2.6	6.8	8.6	13.0	4.8
	Zone Average	0.7	3.6	9.8	17.9	20.4	8.5
Car	1	0.0	0.0	0.0	4.4	34.5	4.2
	2	0.0	0.0	0.0	0.4	31.5	1.9
	3	0.0	0.7	0.4	9.0	40.0	5.4
	4	0.0	0.4	0.0	2.5	11.5	1.8
	5	0.0	0.0	0.0	5.3	20.7	1.3
	6	0.5	0.0	0.5	2.1	9.3	1.0
	Zone Average	0.1	0.2	0.2	4.0	24.4	2.6

3. *Implications of Commuting Behavior for Transport Planning*

What are the implications of Table 8 for transportation planning? The fact that a large fraction of commuters have chosen to live very close to where they work and, hence, are able to walk to work, might appear to imply that, in the short run, they are unlikely to benefit from improvements in bus and rail transit. This is especially true for the poor, who rely more on walking than the non-poor.

These statements, however, ignore the spatial dimensions of the problem. If one breaks mode choice down by income and zone of residence (see Table 9), it is clear that the modal share for rail and bus vary significantly by zone. The share of rail is highest in zones 2, 4 and 6 (23%, 28% and 32% respectively), whereas it is highest for bus in zones 2 and 5 (19% and 18% respectively). If we focus on the poor, it is clear that a non-negligible fraction of the poor rely on rail in the suburbs (zones 4-6) and on buses in zones 1-3. For example, 25% of low-income commuters who live in zone 6 take rail to work; 21% of low-income commuters in zone 2 use the bus as their primary commute mode. These commuters would, even in the short run, benefit from improvements in transit service and/or fares.

C. Travel for Other Purposes

What are the travel patterns of poor and non-poor households for non-work trips? To answer this question we summarize the trips taken by the 11,077 household members who filled out travel diaries.[10] Three types of people received travel diaries: the main income earner of the household, a randomly chosen adult over 21 years old, and a randomly chosen person between 16 and 20 years old. An analysis of trips reported in the travel diaries requires some weighting of the data. Since the probability of receiving a diary differs across household members, the number of trips reported is weighted by the household member's selection probability to obtain the share of different type of trips in the population of persons over 16 years old (Table 11 below). Note that, because persons less than 16 years old did not fill out travel diaries, Table 11 is not representative of travel demand by all persons in Mumbai. School trips, for example, are definitely under-represented.[11]

The poor take fewer trips than the non-poor, although the differences are not dramatic. Table 10 reports the average number of trips taken by each type of traveler on the travel day. Although there is a slight increase in the number of trips as income goes up, most wage earners take two trips per day (to and from work). The randomly chosen adult and young person show more significant increases in trip generation as income increases. The major source of the differences is the fraction of people in the lower income categories who don't have a job (for adults) and who don't go to school (in the case of youths) and thus take no trips. For example, among households with monthly incomes less than Rs. 5,000, 55% of "other" adults didn't travel at all; this number,

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[10] The term "trip" refers to a one-way trip from an origin to a destination.
[11] Information on school trips was obtained from the main household survey but is not discussed here.

however, declines to less than 40% in the highest income category. Similar differences are observed among youths. The number of trip taken by non-working adults and non-working, non-student youths are not statistically different across income groups.

Table 10. Number of One-Way Trips per Day by Income

		HH Income					
		<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg.
Main earner	mean	2.02	1.99	2.06	2.13	2.15	2.05
	se(mean)	0.03	0.03	0.03	0.03	0.06	0.01
Adult	mean	1.01	0.98	1.06	1.17	1.26	1.06
	se(mean)	0.04	0.03	0.04	0.04	0.06	0.02
Youth	mean	1.40	1.45	1.52	1.81	1.86	1.54
	se(mean)	0.07	0.05	0.06	0.07	0.14	0.03

Do the types (purposes) of trips differ between the poor and the non-poor? Table 11 shows the distribution of trips by purpose, broken down by income group. Excluding "return home," which is a mixture of return trips of all purposes, work trips represent roughly half of all trips made, for all income groups. About 30% of trips are for shopping, health care and other personal business. On average, households with monthly incomes of at least Rs. 20,000 make fewer shopping and medical trips and more trips for personal business than do the poor. The share of trips made for shopping, doctor's visits and personal business does not, however, differ significantly between the poor and households in the next two income categories (Rs. 5,000-7,500 and Rs. 7,500-10,000). About 14% of trips are made for entertainment or social purposes. Although the share of entertainment trips increases slightly with income, trips for social visits do not vary much in frequency across income groups.

Thus we conclude that trip generation is relatively similar across income groups except that more people work or go to school as income increases. Of course for work trips, the causality may go the other direction: if a household has more than one worker, it tends to earn more than a single-worker household. The issue of whether mobility is an important obstacle to working or schooling will be examined in the sections IV and III-D, respectively.

As far as mode choice is concerned, walking is, on average, the most frequently chosen mode for all trip types (see Table 12). Shopping and health care trips are predominantly made on foot (modal shares of 82% and 67%, respectively). Buses are used for a significant fraction of school trips (22%) as well as trips for personal business (18%) and entertainment (16%). The share of trips made by rail is highest for school trips (15%), social visits (14%) and personal business (13%). This reflects that fact that distance traveled is, on average, longest for these trips. The modal shares of motorcycles and cars are highest for entertainment and personal business trips. This may reflect the fact that entertainment and personal business trips are made more frequently by high income people. The mean time and distance of the trip by purpose and mode are summarized in Appendix D, Tables D-2 and D-3.

Table 11. Percentage Distribution of Trips by Purpose, for Each Income Group

Purpose	HH Income					
	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg.
Work	25.4	25.4	23.0	23.0	24.7	24.3
Shopping	7.8	8.3	7.8	8.0	6.8	7.9
School	4.6	4.5	5.3	5.0	3.9	4.8
Social Visit	4.0	3.9	5.2	4.7	3.9	4.4
Entertainment	2.0	2.3	2.4	3.0	3.2	2.5
Doctor/Hospital	2.0	1.6	1.9	1.6	0.8	1.7
Personal Business	4.9	4.7	4.9	6.0	7.9	5.3
Return to Home	49.0	49.1	49.1	48.2	48.7	48.9
Other	0.3	0.3	0.4	0.3	0.2	0.3
Total	100	100	100	100	100	100

Table 12. Percentage Distribution of Trips by Mode, for Each Trip Purpose

	Work	Shopping	School	Social Visit	Entertain-ment	Health Care	Personal Business	HH Avg
On foot	45.1	82.2	55.5	52.4	51.6	66.9	47.9	52.5
Bicycle	3.5	0.4	0.4	0.4	0.0	0.8	1.2	2.2
Train	20.9	1.5	15.3	13.8	3.5	1.2	13.2	15.4
Public Bus	15.1	6.2	22.3	13.1	16.0	12.8	18.3	14.6
Auto-Rickshaw	2.1	5.4	3.3	7.6	7.0	13.2	6.7	4.3
Taxi	0.3	1.4	0.1	6.3	3.5	3.1	0.8	1.1
Two-Wheeler	8.6	2.5	2.3	3.1	8.0	1.2	8.3	6.4
Own Car	3.2	0.4	0.3	1.6	4.3	0.4	3.3	2.4
Other's car	0.4	0.2	0.1	1.5	6.2	0.4	0.4	0.6
Other	0.8	0.0	0.3	0.3	0.0	0.0	0.0	0.5
Total	100	100	100	100	100	100	100	100

D. Access to Social Services

In view of the importance that social services play in the lives of the poor, our survey included sections asking about trips to school and accessibility of health care.[12] In rural areas, the distance household members must travel to attend school or receive health care is viewed as an indication of how accessible these social services are. The same issues arise in urban areas, where poor households far from hospitals or schools must

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[12] Information on school attendance was obtained for all children in the family aged 5-21. The respondent was asked to describe a typical school trip for a randomly chosen child under age 11, and for a randomly chosen child over age 11. With regard to health care, the respondent was asked how long it takes to walk from his house to the nearest doctor, municipal hospital and private hospital. He was also asked what type of facility would be used if the respondent or his child were seriously ill.

either spend long amounts of time walking or must substitute money for time (e.g., by taking an auto-rickshaw to a hospital) to access these services.

1. *School Attendance and Travel to School*

In examining travel to school, we are interested in several questions: How far must poor children travel to get to school? How much does this cost, in time and money? How do the answers to these questions differ for poor households in different parts of the city? How do they compare to the answers for other income groups? We would also like to know whether the costs of traveling to school are an important factor influencing school attendance rates for children in poor households. This is a much more difficult question to answer. We did, in fact, ask parents the question directly. It is also possible to infer the answer by examining differences in school attendance and travel costs across the city, although we do not attempt a formal statistical analysis here.

We begin by examining school attendance rates, conditional on child age, by income group and zone (Table 13 and 14). As expected, attendance rates at all ages are lower for the children of the poor, and the difference increases with child age. Only 75% of poor children aged 15-16 are in school, compared with 100% of children in the highest income group. The corresponding figures are 40% v. 65% for children 17-21. More surprising is the difference in attendance rates by zone. For all income groups attendance rates for ages 15 and older are much lower in zone 5 and much higher in zone 6 than in the rest of the city. For the poor, 91% of children 15-16 living in zone 6 attend school, compared to only 63% in zone 5. The corresponding figures for persons ages 17-21 are 51% in zone 6 vs. 29% in zone 5.

Table 13. Percent Attending School by Age and HH Income

Age	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg.
<=9	93	97	99	100	98	97
10-14	89	95	98	98	98	94
15-16	75	78	87	95	100	83
17-21	40	42	49	62	65	48

Table 14. Percent Attending School by Age and Zone

		1	2	3	4	5	6
All HHs	<=9	98	98	96	97	96	97
	10-14	93	94	94	94	94	98
	15-16	80	81	87	82	75	92
	17-21	55	46	49	53	35	53
Poor HHs	<=9	96	98	90	94	92	96
	10-14	88	82	89	88	89	96
	15-16	64	70	80	78	63	91
	17-21	53	32	32	43	29	51

Is the difference in attendance rates possibly due to schools in zone 5 being farther away from households in zone 5 than in zone 6? To examine this, we first look at the type of schools attended by the children of the poor. Tables 15 and 16 show the percent of students, by level of schooling and income, attending private (as opposed to public or semi-governmental) schools. As expected, a smaller proportion of poor children attend private schools than do children of the rich; however, it is still the case 44% of poor children attend private schools, compared to 76% of children in the 10-20K income group and 87% of children in the top income group. Interestingly, the percent of poor children attending private schools is much higher in the suburbs (zones 4, 5 and 6) than in zones 1-3. It is especially high in zone 6, where 67% of poor children attend private schools.

Table 15. Percent Attending Private School by Level of School and Income

	<5k	5-7.5k	7.5-10k	10-20k	>20k	HH Avg.
Pre-primary	57	67	77	80	100	69
Primary	40	53	63	91	93	57
Middle school	38	50	57	78	94	52
High school	50	54	67	78	85	62
Technical School	37	47	49	53	69	50
College	65	55	56	60	79	59
Avg. All Levels	44	53	61	76	87	58

Table 16. Percent Attending Private School by Level of School and Zone

		1	2	3	4	5	6
All HHs	**Pre-primary**	62	64	69	74	62	78
	Primary	52	50	53	66	50	70
	Middle school	52	46	38	58	57	68
	High school	66	47	54	64	71	75
	Technical School	83	93	27	18	71	62
	College	70	75	44	52	59	63
	Zonal Avg.	61	54	47	60	58	69
Poor HHs	**Pre-primary**	40	50	48	65	53	73
	Primary	38	31	24	53	35	63
	Middle school	16	28	18	44	44	66
	High school	23	34	27	65	57	71
	Technical School	0	100	20	25	100	50
	College	73	88	43	57	68	71
	Zonal Avg.	30	36	25	53	45	67

To look at the availability of public, private and semi-governmental schools, Table 17 shows the average distance to each type of school attended by children of the poor by type of school, level of schooling and zone.

Table 17 suggests that the difference in attendance rates between zones does not appear to be the result of schools being located farther away from residences in zone 5 than zone 6. It is also the case that, when the respondent was asked directly the reason for a child not attending school, the school "being too far away" was mentioned by only 0.2% of respondents as the reason for non-attendance.

We end by noting that most children of the poor walk to school. Mode choice for school trips by the poor, conditional on distance traveled, appears in Table 18. [Results for other income groups are shown in Table D4 of Appendix D.] For school trips less than 30 minutes away, 93% of poor children walk; for trips that would take more than 30 minutes on foot, 21% walk to school[13], 40% take the public bus and 26 % take the train. Table 18, combined with information on distances traveled, implies that 83% of school trips made by poor children are on foot, 4% by train and 9% by public bus.

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[13] The corresponding figures for children in the highest income group are 56% and 3%.

Table 17. Distribution of Walking Time to School by Level, Type of School and Zone for Poor HHs (Row %)

			<15	15-30	30-60	>60	Don't know
Primary School	**Private**	**1**	67	8	8	17	0
		2	50	10	20	20	0
		3	31	69	0	0	0
		4	69	26	3	0	3
		5	55	36	6	0	3
		6	55	45	0	0	0
	Public / Semi Gov	**1**	71	21	7	0	0
		2	72	28	0	0	0
		3	73	25	0	2	0
		4	50	39	11	0	0
		5	69	27	2	2	0
		6	88	13	0	0	0
Middle School	**Private**	**1**	50	33	17	0	0
		2	60	30	10	0	0
		3	38	38	19	6	0
		4	66	26	9	0	0
		5	60	30	8	0	3
		6	76	22	0	3	0
	Public / Semi Gov	**1**	57	29	11	4	0
		2	61	35	4	0	0
		3	68	30	2	0	0
		4	54	39	7	0	0
		5	54	41	4	0	0
		6	43	39	4	13	0
High School	**Private**	**1**	29	43	29	0	0
		2	63	38	0	0	0
		3	33	56	11	0	0
		4	45	32	16	6	0
		5	48	26	17	9	0
		6	42	50	4	0	4
	Public / Semi Gov	**1**	42	33	25	0	0
		2	56	44	0	0	0
		3	77	13	7	3	0
		4	56	33	0	0	11
		5	50	39	0	0	11
		6	27	64	0	0	9

Table 18. Main Mode to School by Walking Time for Poor HHs (Column %)

	<15	15-30	30-60	>60	Don't know	Avg. All Times
On foot	98	83	37	2	7	83
Bicycle	0	2	0	4	0	1
Train	1	1	7	46	50	4
Public Bus	1	9	42	44	14	9
School Bus	0	2	7	2	14	1
Auto-Rickshaw	0	4	6	0	7	2
Two-Wheeler	0	0	1	0	0	0
Other's car	0	0	0	2	0	0
Other	0	0	0	0	7	0
Total	100	100	100	100	100	100

2. Access to Health Care

From the perspective of transport, one way to define access to health care is to examine how far a poor household is from various health care providers. Since the cost of health services is also a barrier to access, it is also of interest to determine how far poor households are from the health care services that they would actually consult if ill. To determine proximity to health care providers, respondents were asked how long it would take to walk to (a) a private doctor; (b) a municipal hospital; (c) a private hospital.

Table 19. Walking Time to a Private Doctor by Income (Column %)

Minutes	<5k	5k─7.5k	7.5k─10k	10k─20k	>20k	HH Avg.
<10	89.1	92.1	89.8	92.8	84.4	90.4
10─20	8.5	6.7	8.6	6.2	14.6	8.0
21─30	1.7	0.9	1.3	0.9	0.7	1.2
>30	0.4	0.0	0.3	0.1	0.0	0.2
Don't know	0.4	0.3	0.1	0.0	0.3	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 20. Walking Time to a Municipal Hospital by Income (Column %)

Minutes	<5k	5k─7.5k	7.5k─10k	10k─20k	>20k	HH Avg.
<15	32.1	36.3	38.2	45.4	38.6	37.4
15─30	36.3	35.4	35.8	33.0	28.3	34.8
30─60	19.4	18.0	18.8	12.6	14.6	17.4
>60	7.8	6.2	3.6	4.3	7.1	5.8
Don't know	4.4	4.1	3.7	4.7	11.4	4.7
Total	100.0	100.0	100.0	100.0	100.0	100.0

Table 21. Walking Time to a Private Hospital by Income (Column %)

Minutes	<5k	5k—7.5k	7.5k—10k	10k—20k	>20k	HH Avg.
<15	66.2	69.4	71.1	79.9	79.2	71.4
15—30	27.5	25.1	25.2	16.9	18.5	23.9
30—60	4.9	4.4	2.9	2.4	1.0	3.6
>60	0.9	0.7	0.6	0.6	0.7	0.7
Don't know	0.5	0.4	0.3	0.2	0.7	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

Not surprisingly, access to health care, as measured by the travel time (in minutes of walking time) required to reach the nearest private doctor, municipal hospital and private hospital (Tables 19-21), decreases with income: 89% of poor households report that they are within a 10 minute walk of a private doctor, 68% within a half-hour walk of a municipal hospital and 66% within a fifteen minute walk of a private hospital. The corresponding figures for the 10-20K Rs. income group are 93%, 78% and 80%, respectively, suggesting that the poor are somewhat farther away from health care than the non-poor.

We also asked respondents which health care provider they would choose if they were to require immediate medical attention, and how they would get to the health care provider. As Table 22 indicates, most respondents would go to a private doctor; however, the percent choosing a private doctor increases with income, while the percent choosing a municipal hospital decreases with income, from 35% among the poorest households to only 3% in the highest income group.

Table 22. Choice of Health Care Provider by Income and Reason for Choice (Col. %)

Provider Chosen	<5k	5-7.5k	7.5-10k	10-20k	>20k	HH Avg.
Private Doctor	56.1	65.2	71.5	72.9	72.8	66.0
Municipal Hospital	35.3	24.8	15.4	7.2	3.0	21.1
Private Hospital	8.7	10.1	13.1	19.9	24.3	13.0
Reason for Choice	<5k	5-7.5k	7.5-10k	10-20k	>20k	HH Avg.
Distance	33.5	36.4	33.1	29.7	22.6	32.9
Cost	33.0	20.0	10.7	3.3	1.3	17.3
Quality	32.3	42.7	55.3	66.1	74.8	48.8
Other reason	1.2	1.0	0.8	0.9	1.3	1.0

People were also asked why they chose the health care provider that they did. For the poorest income group, proximity of the health care provider was cited as the main reason for choosing a provide one-third of respondents, cost by another third of respondents and quality by the remaining third. Most respondents who cited distance as the main factor influencing their choice went to a private doctor, while most who cited cost went to a municipal hospital. The percent of respondents citing distance as the main factor motivating their choice of health care provide declines only slightly with income. (Proximity is likely to be important in assuring timely treatment.) However, as one

would expect, the importance of cost declines with income while the importance of quality increases.

Tables 18-22 together suggest that although most people (95-98% depending on the income category) are within a 15 minute walk from some health care provider, the poor are somewhat farther away from the provider of their choice: 73% of the poor walk less than 15 minutes to reach their service provider compared to 91% for households earning 10-20k; 7% of the poor are more than 30 minutes away from their chosen healthcare provider. while virtually nobody is among the 10-20k group.

There are also significant differences in access to health services across zones. Here we focus on poor households in each zone.[14] From Tables 23-25, we note first that the access to a health service provider is considerably worse for zone 4, followed by zones 1 and 5. Except for zone 4, the access to a private doctor is almost the same for all zones, with more than 90% of the people having a private doctor within a 10 minute walk. Access to a municipal hospital is significantly better in the city center (especially zones 2 and 3) than in the suburbs (zone 4 and 5), whereas access to a private hospital is better in the suburbs. Although it is the case that most poor households have some sort of health care service provider within a 15-minute walk (89%-97% depending on zone), access to affordable health care is somewhat different.

Table 23. Walking Time to a Private Doctor by Zone for Poor HHs (Col. %)

Minutes	1	2	3	4	5	6	Avg. All Zones
<10	90	97	91	77	92	92	89
10-20	8	3	7	16	7	7	9
21-30	2	0	2	4	1	1	2
>30	0	0	0	2	0	0	0
Don't know	1	0	0	2	0	0	0
Total	100	100	100	100	100	100	100

Table 24. Walking Time to a Municipal Hospital by Zone for Poor HHs (Col. %)

Minutes	1	2	3	4	5	6	Avg. All Zones
<15	29	45	44	19	24	34	32
15-30	36	31	35	26	43	46	36
30-60	35	22	7	22	27	14	19
>60	1	2	13	15	6	4	8
Don't know	0	0	1	18	0	3	4
Total	100	100	100	100	100	100	100

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[14] The differences in walking times across zones noted for poor households tend to hold for all households, regardless of income.

Table 25. Walking Time to a Private Hospital by Zone for Poor HHs (Col. %)

Minutes	1	2	3	4	5	6	Zonal Avg.
<15	50	52	84	66	61	72	66
15-30	38	41	14	26	33	24	27
30-60	10	8	2	5	5	4	5
>60	1	0	1	2	1	0	1
Don't know	1	0	0	2	0	0	1
Total	100	100	100	100	100	100	100

This difference in access is reflected in the choice of health care provider: Twenty-eight percent of respondents in poor households choose a municipal hospital in the suburbs, compared to 54% in the city center. In contrast, 12% of poor respondents in the suburbs would go to a private hospital if they needed immediate medical attention, compared to 5% in the city center. More poor respondents in the suburbs claim that distance is the main factor influencing their choice (36% as opposed to 30%), while fewer quote cost as the reason (28% in the suburbs vs. 39% in the city center). It seems that in the suburbs, poor people are somewhat father away from affordable health services and distance may constrain their choice.

The mode the respondent would take to a healthcare provider reflects this difference. Since people are traveling longer distances in the suburbs, they rely more on auto rickshaw rather than walking (see Table 26), which make health services even more costly to the poor in suburbs.

Table 26. Main Mode Chosen for Health Care Trips by Zone for Poor HHs (Column %)

Mode	1	2	3	4	5	6	Zonal Avg.
Walk	60	82	78	52	63	48	64
Bus	8	2	1	1	2	2	2
Auto Rickshaw/Taxi	30	16	22	45	34	49	34
Other	2	0	0	2	0	0	1
Total	100	100	100	100	100	100	100

E. Access to Transportation

1. Distance to Public Transportation

We have seen in the preceding sections that poor households rely heavily on walking compared to richer households. Is this because the poor don't have equal access to public transportation? This section examines the accessibility of various income groups to public transportation. One measure of accessibility is distance to the nearest public transit stop. Our main findings are that there are not significant differences between the poor and the non-poor in the time it takes to walk to the nearest bus stop. There are, however, differences in walking time to the nearest train station. Only 52% of

the poor are within a 20 minute walk of a train station, whereas 70% of commuters in the 10,000-20,000 Rs. group are. This could reflect higher land prices near rail lines, or the fact that the poor choose jobs closer to their homes than the non-poor (due to labor market networks) for reasons unrelated to the availability of public transit.

Table 27 indicates that although the poor live slightly father away from a bus stop than the non-poor, 45% live within a 5 minute walk and over 90% live within a 10 minute walk from a bus stop. Virtually everyone (98.5 %) has a bus stop within a 10 minute walk from their work place. So, virtually everyone has bus service available to them.

Table 28, in contrast, indicates that a larger percent of the poor are at least a 20 minute walk from a railway station (47%) than any other income group (Table 28). The proportion of households more than 30 minutes away from a train station is 24% in the poorest income category as opposed to 12.5% in the Rs. 10,000-20,000 income category. These results are mirrored in Table D-5 in the appendix, which shows out-of-vehicle travel time by income group and mode. Out-of-vehicle travel time to rail stations is higher for the poor (17 minutes on average) than for other income groups. A possible explanation for these facts is that land prices are higher near rail lines and that the cost of living closer to rail for the poor is not worth the increased access to employment opportunities this would buy.

Table 27. Percent of Households Living at Various Distances from a Bus Stop, by Income Group

min walking	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg
<5	45.0	48.8	50.3	57.7	55.2	50.1
5-10	46.2	43.6	41.9	37.5	41.9	42.7
10-20	7.4	6.8	7.0	4.7	2.9	6.4
20-30	1.4	0.9	0.8	0.1	0.0	0.8
Total	100	100	100	100	100	100

Table 28. Percent of Households Living at Various Distances from a Train Station, by Income Group

min walking	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg
<5	5.5	5.4	7.9	9.3	8.1	6.8
5-10	17.9	18.6	19.1	21.9	12.0	18.7
10-20	28.8	33.3	39.1	38.8	39.0	34.7
20-30	23.3	24.4	19.0	17.0	17.5	21.2
>30	23.8	18.0	13.8	12.5	22.7	17.9
Don't Know	0.7	0.3	1.1	0.6	0.7	0.6
Total	100	100	100	100	100	100

2. Cost and Quality of Public Transit

Distance to public transportation is not the only factor influencing transit use. Cost clearly matters, as does the quality of transit service. Table 29 lists the cost of rail and bus service in Mumbai. The cost per km of traveling by rail is much cheaper than the cost of bus service, especially if a monthly pass is purchased. For example, a worker with a one-way commute of 20 km would pay only Rs. 90 per month to commute by rail—less than Rs. 4 per day. The cost per day of commuting 20 km via bus is, by contrast, Rs. 20.

It is, of course, the case that the out-of-pocket cost of rail and bus constitute a much higher fraction of income for the poor than for the non-poor, and that this also explains the less frequent use of these modes by the poor. Table 30 shows the percent of household income spent on transportation by the commute mode of the principle wage earner.[15] The results are striking: for the poorest households whose main earner commutes by train, transportation expenditures are 17% of income; when the main earner commutes by bus they are over 19% of income.

Table 29. Cost of Rail (Second Class) and Bus (Regular Service)

Rail Fare			Bus Fare	
Distance (km)	Monthly Pass (Rs.)	One way (Rs.)	Distance (km)	One way (Rs.)
1 - 5	60	4	0 - 3	3
			3 - 5	4
6 - 10	60	4	5 - 7	5
			7 - 10	6
11 - 15	75	5	10 - 15	9
16 - 20	90	6	15 - 20	10
21 - 25	105	7	20 - 25	11
26 - 30	105	7	25 - 30	12
31 - 35	120	8	30 - 35	13
36 - 40	135	9	35 - 40	15
41 - 45	150	10	40 - 45	17
46 - 50	165	11	45 - 50	19
51 - 55	180	11	50 - 55	21
56 - 60	195	12	55 - 60	23

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[15] Note that the transportation expenditure shown in the table is not solely for the journey to work.

Table 30. Share of Expenditure on Transportation by Income and Commute Mode of Principal Earner

	Walk	Train	Bus	MTW	Car
<5k	12.5%	16.8%	19.4%	28.5%	NA
5-7.5k	8.6%	9.3%	9.9%	19.8%	NA
7.5-10k	7.8%	8.3%	8.7%	16.0%	NA
10-20k	7.6%	9.0%	8.4%	14.4%	20.0%
>20k	7.8%	6.8%	5.8%	11.6%	14.2%

We also asked people their perceptions of the quality of rail and bus service. Specifically, respondents were asked to rate the quality of service on a three-point scale, corresponding to "positive," "neutral" and "negative." Perceptions of quality are summarized by income group in Tables 31 and 32. Two results stand out: The first is that a majority of respondents have a positive opinion of the reliability (63%), safety (67%), convenience (68%) and frequency (59%) of bus service. Crowding on buses is seen as a problem by 35% of respondents, but the percent complaining about crowding is less for the poor (32%) than for the rich (49%). A majority of respondents have a favorable impression of the frequency (78%), convenience (70%) and reliability (63%) of rail service. Crowding is definitely viewed as a problem on trains (by 62% of respondents), as, to a lesser extent, is safety (by 21% of respondents). Again, it is the rich who are more likely to complain about crowding than the poor; however, the poor are more concerned about safety than the rich. These differences, however, are not dramatic: One of the most striking facts about the tables is how little quality ratings vary by income group.

There is, however, more variation in perceptions of transit quality across geographical zones. Households in some zones are clearly less satisfied with crowding on both bus (zone 4) and train (zone 2 & 4). The charts by zone in same the format appear in Appendix D (Tables D-5 and D-6).

Table 31. Percent of Households in Each Income Group with Various Opinions About the Quality of Bus Service

		<5k	5-7.5k	7.5-10k	10-20k	>20k	HH Avg.
Reliability	**Positive**	62	64	62	64	67	63
	Neutral	31	30	32	31	28	31
	Negative	7	6	6	5	6	6
Crowding	**Positive**	36	39	36	30	21	35
	Neutral	31	29	32	30	30	31
	Negative	32	32	32	40	49	35
Safety	**Positive**	65	71	65	67	66	67
	Neutral	27	23	29	26	25	26
	Negative	8	7	7	7	9	7
Convenience	**Positive**	66	69	69	67	69	68
	Neutral	27	23	24	27	25	25
	Negative	8	7	8	6	6	7
Frequency	**Positive**	56	62	59	60	60	59
	Neutral	30	26	30	26	30	28
	Negative	14	12	12	14	10	13

Table 32. Percent of Households in Each Income Group with Various Opinions About the Quality of Rail Service

		<5k	5-7.5k	7.5-10k	10-20k	>20k	HH Avg.
Reliability	**Positive**	58	60	65	71	70	63
	Neutral	34	32	29	24	26	30
	Negative	8	9	7	5	4	7
Crowding	**Positive**	17	18	20	17	19	18
	Neutral	22	21	20	18	10	20
	Negative	61	61	60	65	70	62
Safety	**Positive**	43	47	47	51	54	47
	Neutral	33	32	33	31	28	32
	Negative	24	21	20	18	18	21
Convenience	**Positive**	68	71	72	71	74	70
	Neutral	26	24	24	23	20	24
	Negative	6	5	5	6	6	5
Frequency	**Positive**	76	79	79	79	80	78
	Neutral	20	17	18	18	16	18
	Negative	4	3	3	3	4	3

3. Access to Motor Vehicles, Roads and Footpaths

The survey also inquired about vehicle ownership and access to roads and footpaths. As expected, ownership of motor vehicles differs by income group (see Table 33). For private cars, ownership is virtually limited to households with more than Rs. 10,000 of income. While 5.4% of our sample households overall own cars, in the highest income group, ownership is 45 percent. A larger proportion of households owns motorcycles (14.5% overall), with ownership concentrated in the mid- and upper-income categories. Bicycle ownership is relatively constant across income groups, ranging from 12% for the poorest to 10% for the wealthiest.

Table 33. Percent of Households in Each Income Class Owning Motor Vehicles

	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg
Bicycle	12.4	11.7	11.8	10.7	9.7	11.6
Motor Cycle	1.5	7.4	17.7	33.4	36.7	14.5
Car	0.2	1.2	1.3	11.1	45.1	5.4

Access to roads also differs significantly across income groups. The condition of roads in the neighborhood clearly improves as income increases (see Table 34). The percent of neighborhoods with a road that is accessible to vehicles throughout the year rises from 65% for the poorest households to 76% in the richest income group. The proportion of neighborhoods with "no road" declines from 22% to 8%, respectively. The availability of footpaths also increases with income, but is generally low: 27% of poor households have footpaths in their neighborhood; 33% of households in the highest income group have a footpath in their neighborhood.

Table 34. Percent of Households in Each Income Group with Access to Roads and Footpaths

	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg
No road	21.6	21.7	19.0	13.0	7.8	18.7
Not vehicle accessible	1.9	1.5	1.9	2.3	5.7	2.1
Vehicle accessible only in dry season	11.9	9.4	8.2	8.9	10.5	9.8
Vehicle accessible all year	64.6	67.3	70.9	75.8	76.0	69.4
Footpath	26.6	29.6	30.2	36.2	33.4	30.3

4. Affordability of Transportation

Our survey data can also be used to calculate each household's expenditure on transportation and to express this expenditure as a fraction of income. These results appear in Table 35. Expenditures on transportation increase steadily as income rises,

reflecting the shift to more expensive transport modes: from walking to public transport and, eventually, to private cars, as people become richer. The share of transport-related expenses, however, is highest among the poorest households, where it constitutes 15% of income. It remains approximately constant at 10% of income for the rest of the income categories. This suggests that for the very poorest households, access to transportation (in money terms) is expensive and may affect mobility.

Table 35. Mean Per Capita Expenditure (Rs./Month) on Transportation and Share in Income, by Income Group

	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	HH Avg
Bus	43	49	53	67	65	52
Rail	25	31	40	53	72	38
Taxi	27	33	43	78	100	46
School Bus	1	1	3	9	12	4
Fuel	13	33	52	134	378	71
Bicycle Repair	1	5	10	24	79	13
Vehicle Repair	0	0	0	0	1	0
Total (fare & fuel only)	108	148	191	341	628	211
Total (incl. maintenance)	110	153	201	365	707	224
Share(fare & fuel only)	14.7%	9.3%	8.9%	9.6%	8.2%	9.6%
Share(incl. maintenance)	14.9%	9.6%	9.4%	10.3%	9.2%	10.2%

F. Summary of Findings

Several points regarding urban poverty and transport in Mumbai are worth emphasizing:

1. Although there is considerable heterogeneity in income among residential neighborhoods in Mumbai, a greater percent of the poor live in Zones 5 and 6 than do other groups, especially higher income groups: 37% of the poor live in these zones v. 21% of the top income group and 23% of the next highest income group (Table 3).

2. It is clear that, within each residential zone, the poor on average commute shorter distances, implying that they work closer to home than the non-poor (Tables 5 and D-1). Related to this is the fact that the poor use less motorized transit (including rail) than higher income groups, regardless of the zone in which they live (Table 9).

3. The result of 1. and 2. is that a higher fraction of the poor work in zones 5 and 6 (24%) than do the highest income group (9%) or the next highest income group (13%). In contrast, a smaller fraction of the poor work in zones 1-3 (49%) than the highest income group (65%).

These facts raise the following questions:

1. Is the cost of motorized transport the reason that the poor commute shorter distances and choose jobs closer to home than the non-poor?

The time and money costs of public transit are higher for the poor than for other income groups, which may indeed explain their short commutes. It is clear that the out-of-vehicle time cost of riding rail is higher for the poor given their current residential locations: 52% of the poor are within a 20-minute walk (or less) of rail, whereas 70% of the 10-20K income group are so situated. (There is less difference in-out-of vehicle times for bus.) Furthermore, the out-of- pocket cost of rail and bus are higher as a percent of income for the poor than for other income groups (Table 30). Poor households in which the main earner commutes by bus spend 19% of their income on transport. The figure is 17% when the main earner commutes by rail.

On the other hand, labor market imperfections and the high cost of living near rail lines could also explain the fact that the poor work closer to home than the non-poor. Munshi and Rosenzweig (2004) emphasize the importance of networks, formed along caste lines, in determining the jobs available to workers in Mumbai. These networks are especially important for laborers and unskilled workers. It is possible that such networks limit the geographic mobility of workers as well. The higher cost of living near rail lines can be explored using data on housing prices.

2. Would the poor (especially those in zones 5 and 6) be better off if they did commute farther? Would lowering the cost of transport enable the poor to move to better housing and/or higher paying jobs?

The answer to the first question depends on tradeoffs between the cost of commuting and earnings from working in different parts of the city. This requires examining how wages vary across Mumbai for different occupations. We present such results in the next section. Whether the lower cost of housing in zones 5 and 6 compensates for either the costs of commuting from these zones to the CBD, or for possibly lower wages for people who do not commute, depends on how housing costs vary across Mumbai. We explore this in the next section.

IV. Rents, Wages and Transport Costs in Mumbai

Whether transport costs prevent the poor of Mumbai from earning higher incomes or living in better housing depends on the spatial pattern of wages and rents in the GMR. In this section we examine how wages and rents vary across Mumbai.

A. Housing Prices and Housing Quality in Mumbai

It is useful to begin by presenting the stylized facts about the housing stock and housing turnover in Mumbai. Table 1 shows the percent of each income group in our sample living in various types of housing in Mumbai—squatter settlements (slums), chawls or wadis (low-quality apartments), cooperative housing and other types of housing (e.g., employer-provided housing). Approximately 40% of our sample households live in slums, 35% in chawls and wadis and 21% in cooperative housing. Over half of the poor live in slums, with 37% living in either chawls or wadis. Table 36 (also based on sample data) shows the distribution of housing types by zone. Slums constitute the largest share of residential housing in zones 5 (79%) and 6 (47%) and the smallest share in zones 1 (19%) and 4 (17%).

Table 36. Percent of Households in Different Types of Housing by Zone

	Zone						Zonal Avg.
	1	2	3	4	5	6	
Slum	19.2	36.8	35.1	16.9	78.9	47.3	38.7
Chawl/Wadi	52.0	39.9	37.5	50.2	7.3	24.0	35.2
Coop/Employer-Provided Housing	28.7	23.3	27.4	32.9	13.8	28.7	26.1

The quality of housing, holding housing type constant, varies significantly by zone. Table 37, which describes housing characteristics by housing type and zone, indicates that 74% of slum houses in zone 3 have piped water connections, whereas only 19% of the slum houses in zone 4 do. Forty-two percent of chawls in zone 1 have toilets, whereas only 6% of chawls in zone 5 are so equipped. This suggests the importance of controlling for housing characteristics when comparing the price of housing at various locations in Mumbai.

Table 37. Housing Characteristics by Housing Type and Zone

	Zone	Slum	Chawl	Coop/ Employer Provided	All Types
Kitchen in the unit	1	24%	59%	87%	60%
	2	26%	46%	87%	48%
	3	40%	41%	97%	56%
	4	55%	37%	89%	57%
	5	41%	63%	100%	50%
	6	34%	46%	94%	54%
	Zone Avg	37%	45%	92%	54%
Toilet in the unit	1	8%	42%	73%	45%
	2	6%	10%	65%	21%
	3	4%	18%	98%	35%
	4	13%	16%	88%	39%
	5	4%	6%	96%	16%
	6	5%	26%	91%	35%
	Zone Avg	5%	21%	86%	32%
Bathroom in the unit	1	38%	75%	96%	74%
	2	50%	80%	98%	73%
	3	61%	53%	98%	68%
	4	43%	47%	91%	61%
	5	28%	60%	98%	40%
	6	24%	54%	94%	51%
	Zone Avg	39%	60%	95%	61%
Water in the unit	1	36%	94%	99%	84%
	2	61%	93%	100%	83%
	3	74%	58%	98%	75%
	4	19%	48%	93%	58%
	5	41%	69%	100%	51%
	6	47%	67%	100%	67%
	Zone Avg	50%	69%	98%	69%
Size (sqft)	1	171	259	417	288
	2	147	208	325	212
	3	190	221	453	274
	4	163	223	492	302
	5	170	200	387	202
	6	182	231	426	264
	Zone Avg	172	226	428	258

Residential mobility in Mumbai is low, for all income groups. As shown in Table 1, approximately 75% of households have lived in their current dwelling for 10 years or

more, and 40% of household heads have lived in their current house since birth. Low residential mobility for slum dwellers may be due to lack of secure title. At higher income levels, rent control and laws, such as building height restrictions, that have effectively reduced the supply of housing are likely responsible for low housing turnover (Phatak, 2003; Bertaud, 2002; Bertaud and Brueckner, 2004).

Regarding housing tenure, 74% of sample households claim to own their own home, whereas 26% indicate that they rent. Surprisingly, 83% of households living in notified squatter settlements claim to own their own homes, although it is unlikely that they possess a transferable title. The large percent of home owners makes the calculation of housing costs difficult. Most of the home owners in our sample likely made a large initial payment for their homes; however we do not know what they paid. Households who say that they own their own homes report making very low monthly payments.[16] We did, however, ask households (both renters and owners) what a house like theirs would rent for each month and what it would sell for.[17] We use the answers to these questions to estimate market prices in Mumbai.

To see how housing prices vary spatially in Mumbai we have plotted, by section, the average price per square foot of slum, chawl and cooperative housing (see Figures 4-6). Figure 4 clearly shows that the cost of slum housing is higher in the center of Mumbai than in the suburbs. The same general pattern obtains for chawls, with a few exceptions. The cost of cooperative or employer-provided housing (per square foot) is also generally higher in zones 1-3 than in the suburbs.

For the poor, do differences in the cost of housing between central Mumbai (especially zones 1 and 2) and the suburbs compensate for differences in wages between zones 1 and 2 and the suburbs? Answering this question requires examining spatial variation in wages received by skilled and unskilled labor, since the majority of workers in poor households fall into these employment categories.[18] We do this in the next section.

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[16] Mortgage markets in Mumbai were relatively undeveloped ten years ago, and few households report making mortgage payments.

[17] We have used the answers to these questions to compute for each household the interest rate that would equate the purchase price of the house to the discounted present value of rental payments. The mean interest rate is 5.6% and the median 4.8%.

[18] Forty percent of workers in poor households (persons who are either the main earner or the second most important earner) are unskilled workers; 30% are skilled workers.

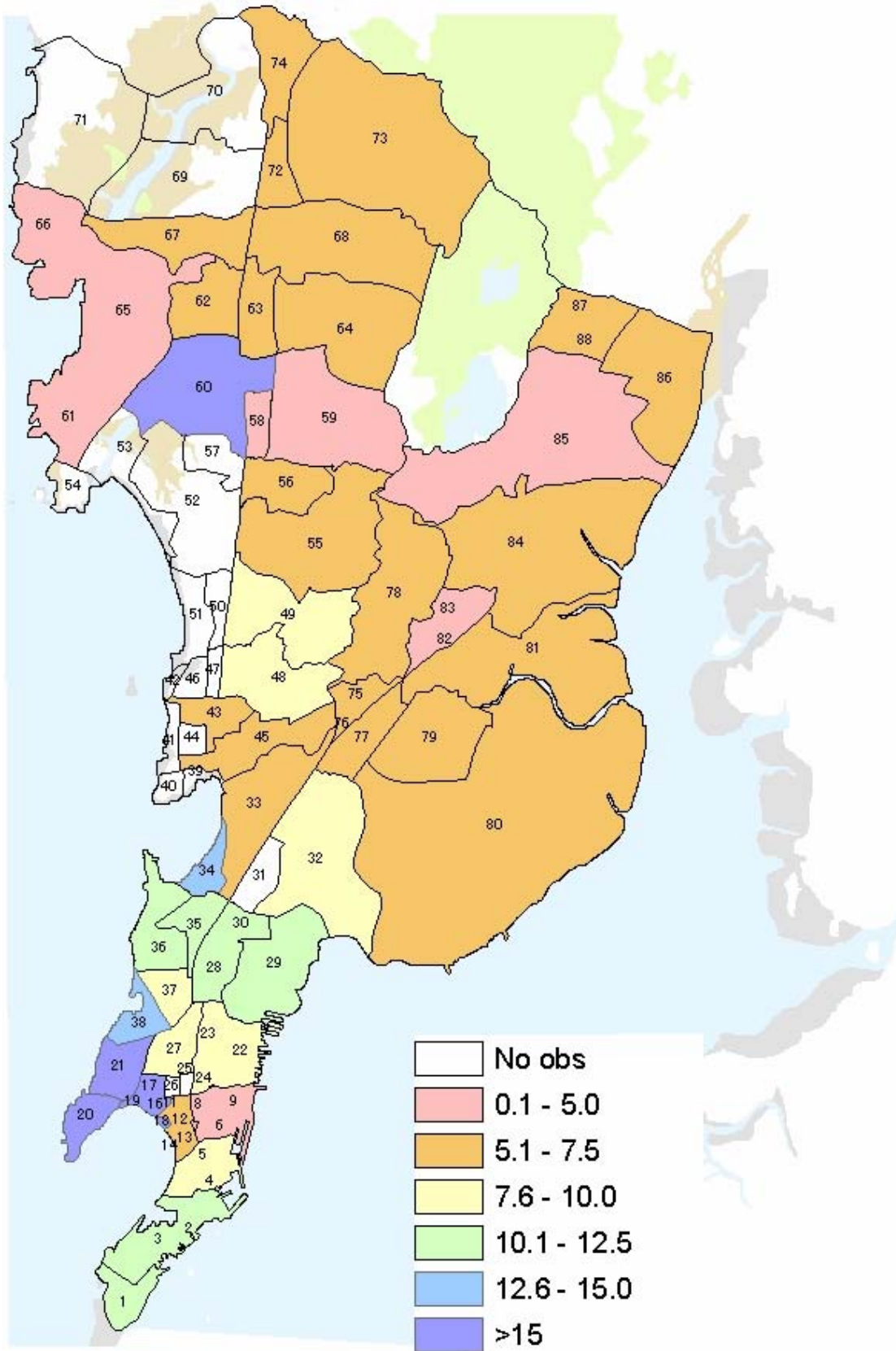**Figure 4.   Mean Rent per Square Foot for Slums (Rs./Month)**

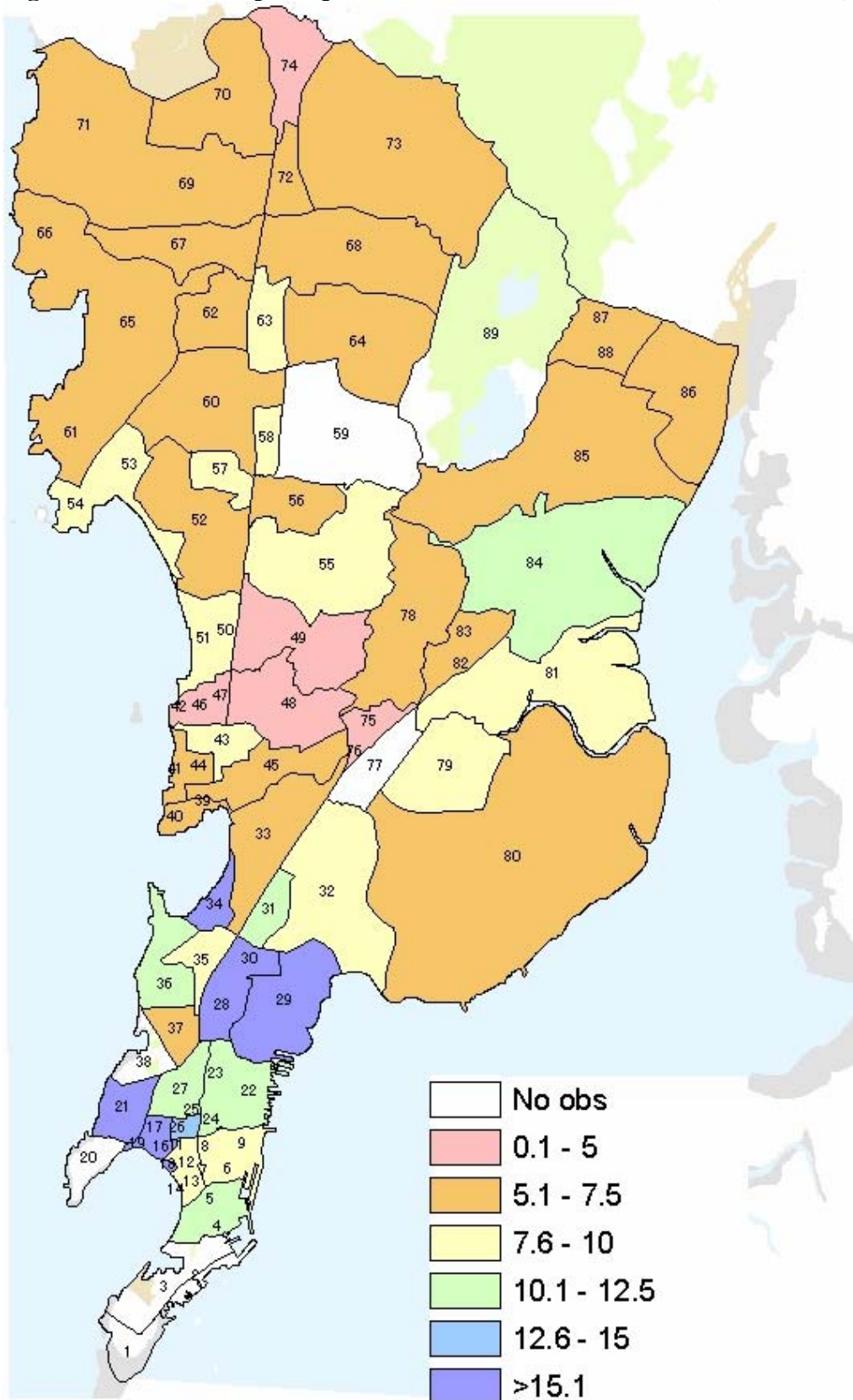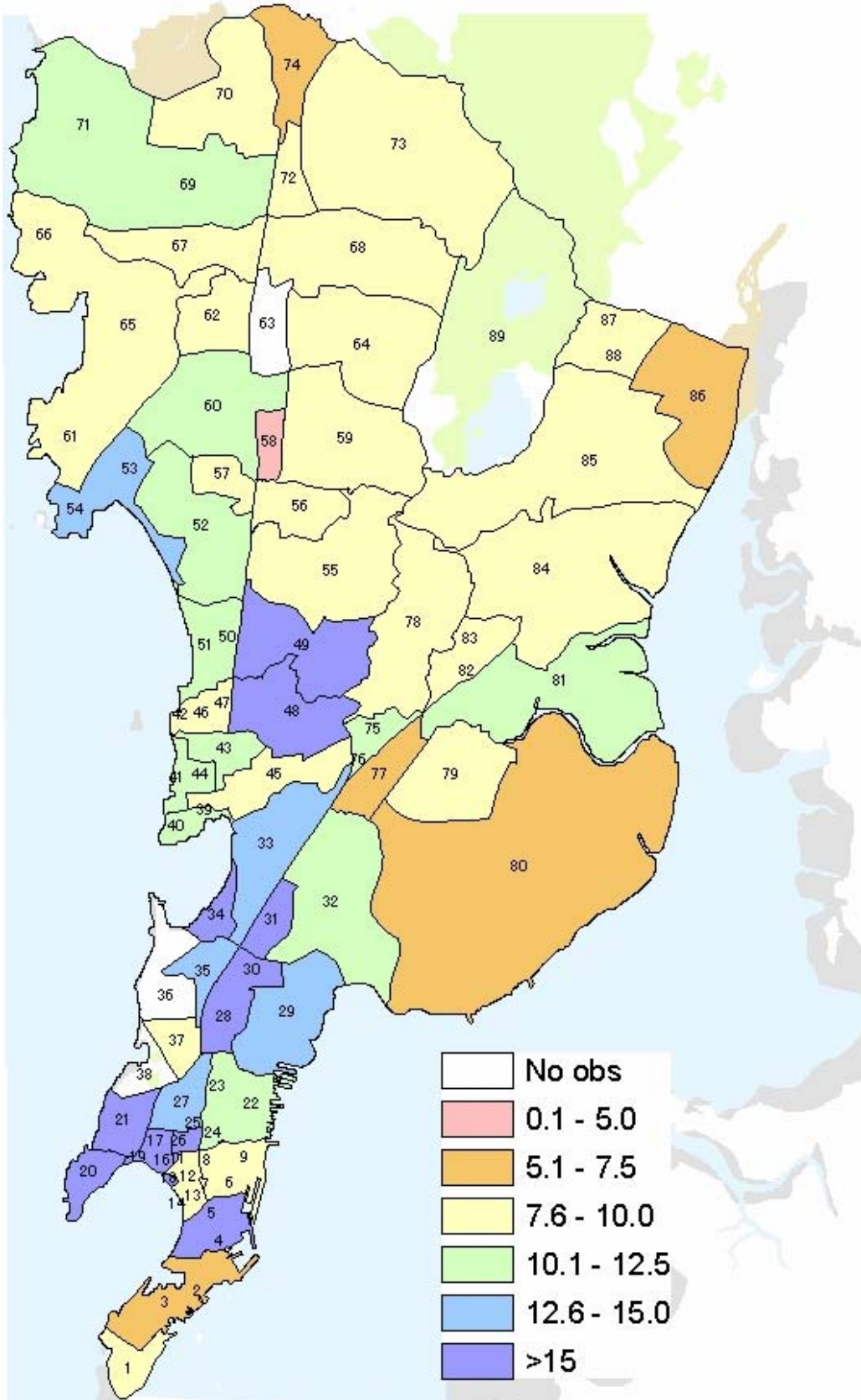**Figure 5. Mean Rent per Square Foot for Chawls and Wadis (Rs./Month)**

Figure 6. Mean Rent per Sq. Ft. for Coop/Employer Provided Housing (Rs./Month)

B. Wages in Mumbai

To shed light on the tradeoff between rents and wages, we use the information from our survey to plot average wages by section and occupation. Figure 7, which shows average wage by section for unskilled workers, indicates that wages for unskilled labor tend to be higher in zones 1 and 2 of Mumbai than in the suburbs; however, there are important exceptions in zones 4 (sections 59) and zone 6 (section 81). Results for skilled workers (Figure 8) are even more mixed. This suggests that determining whether poor households in central Mumbai are better off than poor households in the suburbs is complicated.

One might also wish to ask whether, holding residential location fixed, poor households in zones 5 and 6 would be better off commuting farther than they do currently. Table 38 shows where poor workers in each residential zone work, broken down by skill type. Over 80% of unskilled workers and 70% of skilled workers who live in zones 1-3 also work in the zone in which they live. These percentage fall in zones 5 and 6; nevertheless between 55 and 60% of skilled and unskilled workers in zones 5 and 6 work in the zone in which they live. An interesting question is whether these workers would be better off if they commuted farther than they do.

Table 38. Commuting Pattern of Unskilled and Skilled Workers

| | Work zone | Residential zone | | | | | | |
		1	2	3	4	5	6	Zone Avg
Unskilled	At Home	0.0	2.8	2.6	5.5	0.8	1.0	2.3
	1	93.0	9.7	0.9	5.5	7.3	6.8	12.3
	2	4.7	81.9	4.3	0.0	2.4	8.7	13.8
	3	0.0	1.4	78.4	19.3	4.0	2.9	21.3
	4	0.0	0.0	3.4	65.1	0.0	12.6	15.5
	5	0.0	1.4	4.3	0.0	58.9	4.9	14.8
	6	0.0	0.0	0.0	0.0	8.1	53.4	11.5
	Outside of GMR	2.3	2.8	1.7	0.9	4.8	5.8	3.2
	Not fixed	0.0	0.0	4.3	3.7	13.7	3.9	5.3
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Skilled	At Home	14.3	8.9	8.4	11.4	1.1	1.5	7.2
	1	73.8	24.4	2.4	7.6	6.9	7.5	14.7
	2	7.1	64.4	4.8	1.0	10.3	4.5	11.4
	3	2.4	0.0	68.7	18.1	2.3	6.0	19.3
	4	0.0	0.0	4.8	56.2	0.0	7.5	15.9
	5	0.0	0.0	4.8	0.0	58.6	1.5	13.1
	6	2.4	2.2	1.2	0.0	1.1	55.2	9.6
	Outside of GMR	0.0	0.0	0.0	1.0	4.6	3.0	1.6
	Not fixed	0.0	0.0	4.8	4.8	14.9	13.4	7.2
	Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

There is also the issue of employment security. Table 39 shows the proportion of working-aged men in our sample households who are not working, by household income and zone of residence.[19] These figures suggest that unemployment rates for the poor are highest in zones 5 and 6—9.2% in zone 5 and 19.4% in zone 6—and are much higher than for other income groups. Whether this is the result of high commuting costs requires further study.

Table 39. Percent of Men Aged 25-59 Not Working, by Household Income and Zone of Residence

Zone	<5k	5-7.5k	7.5-10k	10-20k	>20k	HH Avg
1	8.8	9.6	6.8	2.2	4.8	6.3
2	8.1	8.6	6.2	8.2	0.0	7.3
3	3.8	6.0	4.6	4.5	3.6	4.7
4	4.9	4.8	4.1	6.1	4.8	4.9
5	9.2	5.1	4.7	5.7	3.1	6.2
6	19.4	7.7	7.8	5.6	7.8	9.8
Average	8.9	6.8	5.7	5.4	4.3	6.5

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[19] We did not ascertain whether a person was unemployed; hence all that we can report is whether men of working age are employed or not.

Figure 7. Mean Monthly Earnings for Unskilled Laborers (Rs.)
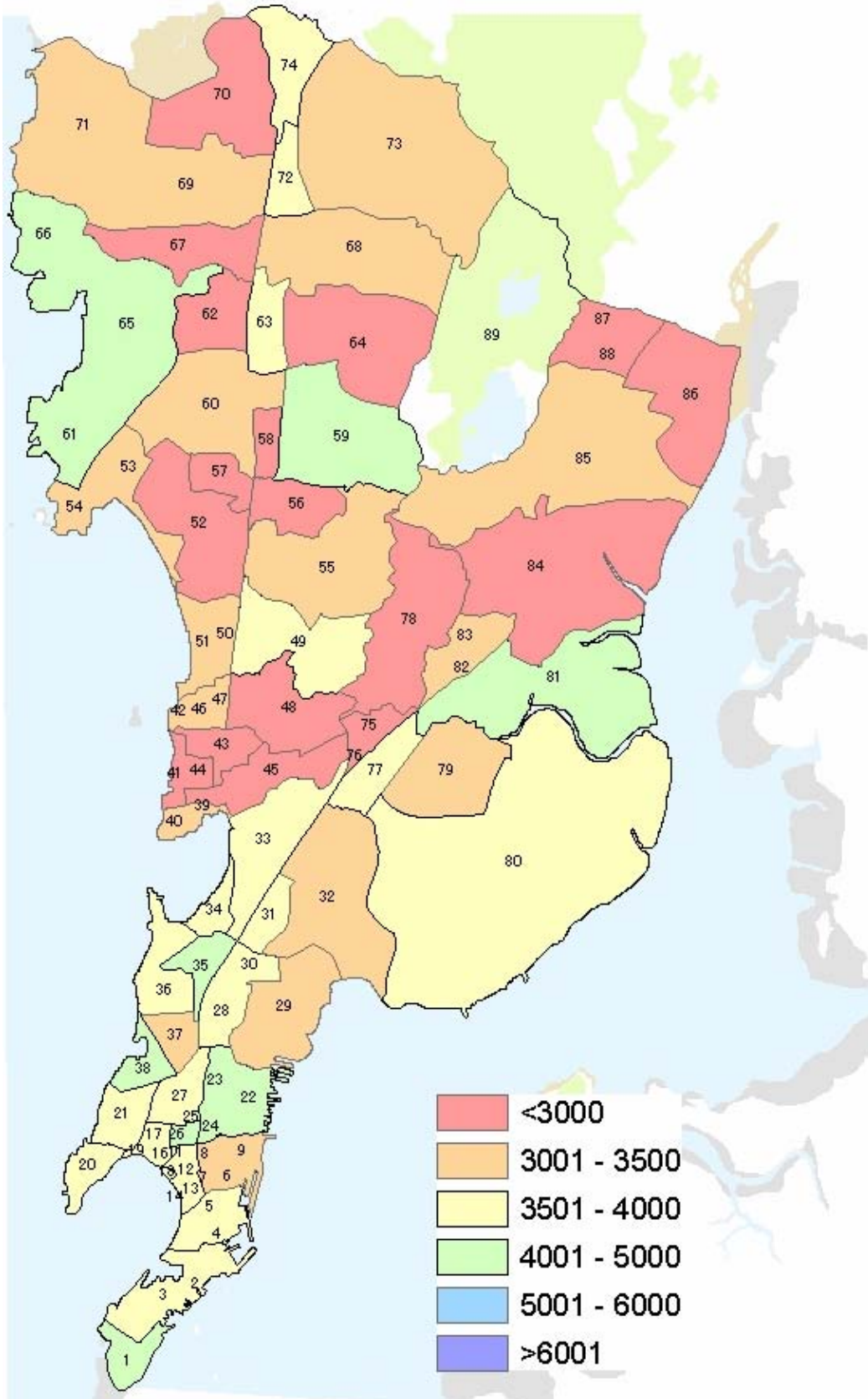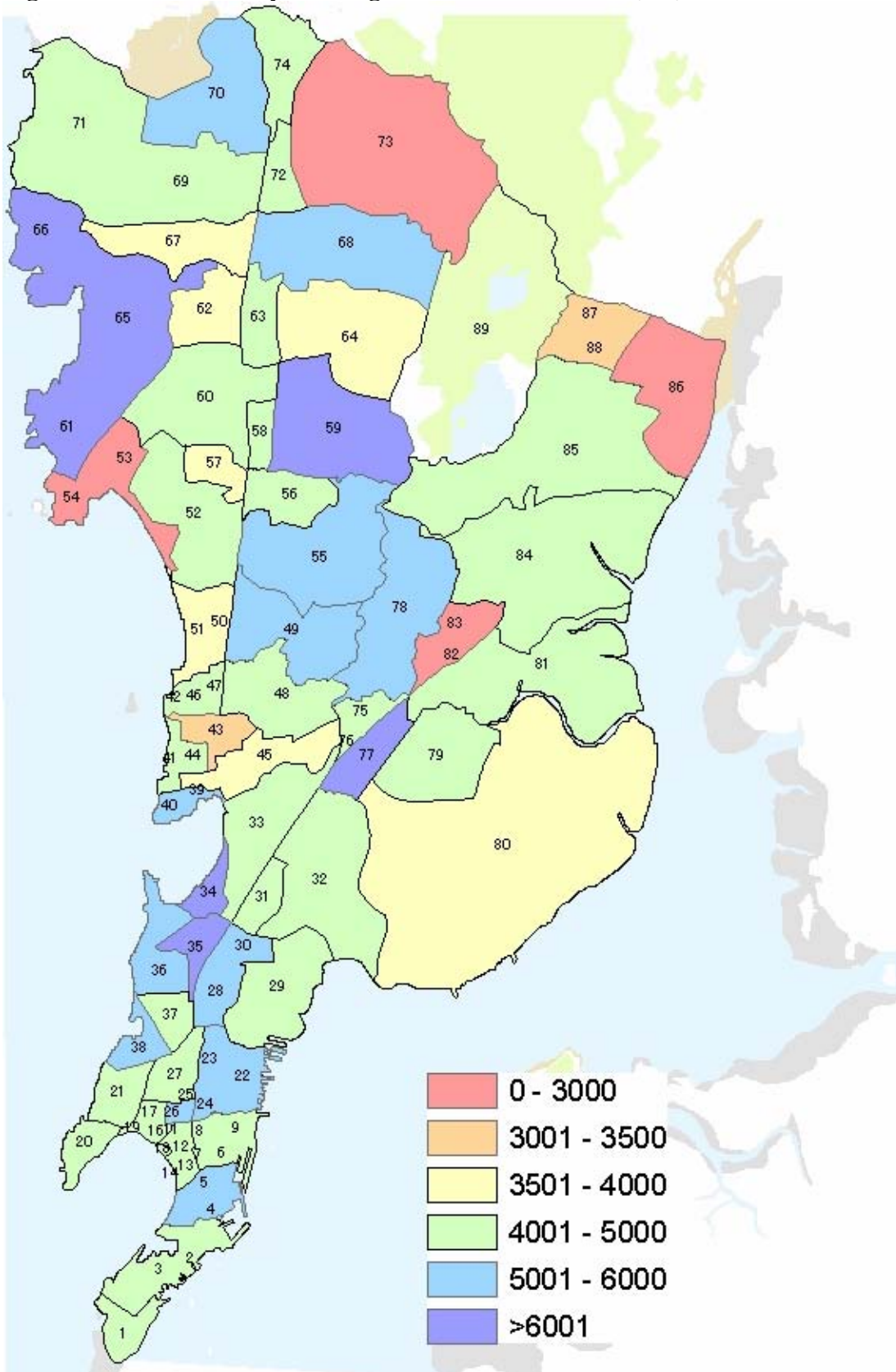
Figure 8. Mean Monthly Earnings for Skilled Laborers (Rs.)

![red]	0 - 3000
![orange]	3001 - 3500
![yellow]	3501 - 4000
![green]	4001 - 5000
![blue]	5001 - 6000
![purple]	>6001

V. Conclusions and Future Research Agenda

A. Major Findings

This study has described the salient facts about travel patterns in Mumbai, for both poor and non-poor households. What do these facts imply about the relationship between urban transport and the welfare of the poor?

A striking finding of our survey is the extent to which all households—but especially poor households—rely on walking. Overall, 44% of commuters in Mumbai walk to work. The proportion of the poor who walk to work is even higher—63%. Walking is an even higher modal share for non-work than for work trips.

A second finding is that public transit remains an important factor in the mobility of the poor, and especially in the mobility of the middle class. Overall, rail remains the main mode to work for 23% of commuters, while bus remains the main mode for 16% of commuters. The modal shares for bus are highest for the poor in zones 1-3 (21% of the poor in zone 2 take the bus to work) while rail shares are highest for the poor in the suburbs (25% of the poor in zone 6 take rail to work).

Is the cost and/or lack of accessibility to transit a barrier to the mobility of the poor? Does it keep them from obtaining better housing and/or better jobs? This is a difficult question to answer without further analysis of our survey data; however, it appears that transport is less of a barrier to the poor who live in central Mumbai (zones 1-3) than it is to the poor who live in the suburbs (zones 4-6).

The poor who live in zones 1-3 of Mumbai (central Mumbai) live closer to the non-poor than do poor households in the suburbs. They also live closer to higher-paying jobs for unskilled workers. Workers in these households, on average, commute short distances (less than 3 km) although a non-negligible fraction of them (one-third in zone 2) take public transit to work. It is true that the cost of housing for the poor is higher in central Mumbai than in the suburbs, but the quality of slum housing is at least as good in central Mumbai as in the suburbs.

The poor who live in the suburbs of Mumbai, especially in zones 5 and 6, are more isolated from the rich than the poor in central Mumbai: 37% of the poor live in zones 5 and 6, whereas only one-fifth of higher income groups do. Wages for skilled and unskilled labor are generally lower in zones 5 and 6 than in the central city, and it appears that unemployment rates for poor males are also higher in these zones. The lower cost of slum and chawl housing in zones 5 and 6 may partly compensate for lower wages; however, a larger proportion of workers in poor households leave zones 5 and 6 to work than is true for poor workers in other zones. Commuting distances are much higher for poor workers in the suburbs than for poor workers in zones 1-3.

B. Future Research Agenda

The motivation for this survey was primarily to inform transportation policy in Mumbai. A natural question to ask is "Does providing better public transit improve people's quality of life, especially for the poor?" To evaluate a public transportation improvement, we need to estimate how people value reductions in travel time, waiting time and/or the provision of new transit services. Estimating models of mode choice will allow us to compute the monetary value of changes in such policies and thus allow us to estimate their welfare effects in the short run, holding people's residential and employment locations fixed. This will allow us to see how the poor and the non-poor in various parts of Mumbai might benefit from transport policies.

A critical issue is whether the proximity of residence and job locations is a result of people's preferences or indicates problems in mobility. Do we see this as an efficient solution, in the sense that commute time is minimized, or rather as a manifestation of mobility constraints? Does the cost of transportation limit people's opportunity to earn higher wages in the city center while enjoying lower-cost or higher quality housing in the suburbs? If mobility is the issue, the benefits of transportation improvement will be much larger in the long run when people can look for better employment opportunities or better housing. To examine the long-run benefits of transport improvements we need to know more about how people choose housing and employment locations. We will need to estimate a model of the choice of housing and employment location in which people evaluate the trade off between money, housing quality and commuting time.

Once such a model has been estimated, it can be used to evaluate the long-run benefits of a transport project; i.e., the benefits during a time frame long enough to allow people to change jobs and/or houses. In addition, the model can be used to evaluate the welfare implications of a slum upgrading or slum relocation project, which represent alternative ways of improving the welfare of the poor Mumbai. This remains a topic for future research.

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Appendix A
Household Questionnaire and Travel Diary

1. Household ID [Format xx-yyyy-z; all numeric and valid values of xx are 1-88]
    XX means Section; validated as above
    YYYY means Enumeration Block
    Z means Household

REPLACEMENT

2. Is this a replacement household?
    1. Yes
    2. No **[GO TO Q5.]**

3. This household replaces number [Format xx-yyyy-z]

4. Reason for replacement
    1. Dwelling not found
    2. Occupant not at home
    3. Refusal
    4. Other _____ (Character / string field with length of 100)

HOUSEHOLD LOCATION

5. Address
    5.1   Street (Character / string field with length of 100)
    5.2   Ward (updateable Pull-down list with all wards in Mumbai)
    5.3   Area (updateable pull-down with Section Names)
    5.4   City (updateable pull-down list having Mumbai, Thane etc.)
    5.5   PIN (updateable pull-down list of pin codes)

Geographic coordinates (using GPS); This value will be allowed to be inserted at any time during the survey until it is marked COMPLETED.

6. Longitude

7. Latitude

INTERVIEW (*no data entry needed*)

8. Date of Interview (Automatic today's date)

9. Interviewer (Automatic from login information)

HOUSEHOLD MODULE

Could you please tell me the first names of all the people who live in your household?
[Start of Household Profile LOOP]

10.   Name of Household Member _____
[List of Household Member can also be found here; once all HH Members are created]

11. Is <NAME> male or female? (Do not ask if obvious from name itself)
    1. Male
    2. Female

12. How old is <NAME>? Age in years)

[Q13. **will be asked to identify main respondent as HH Member list is being generated. Once Main Respondent is idntified SKIP from Q**13. **to Q**18.**]**

13. Is this person the main respondent?
    1. Yes **[GO TO Q**14.**]**
    2. No **[GOTO Q**19. **]**

14. What is your religion?
    1. Hindu
    2. Muslim
    3. Christian
    4. Sikh
    5. Buddhist
    6. Jain
    7. Other _____

15. What is your mother tongue?
    1. Marathi
    2. Hindi
    3. Konkani
    4. Gujrati
    5. Marwari
    6. Pujabi
    7. Sindhi
    8. Kannada
    9. Tamil
    10. Telugu
    11. English
    12. Other _____

16. When did you move here ?
    1. Within last 12 months
    2. 1-2 years ago
    3. 3-5 years ago
    4. 6-10 years ago
    5. >10 years ago
    6. Since birth **[GO TO Q**19.**]**

17. Where did you live before this? (Read list to respondent)
    1. Within same neighborhood
    2. Other neighborhood in Mumbai
    3. Outside Mumbai

18. Why did you move here? Please give two reasons. (Read list to respondent before he answers.)
    1. There was space available
    2. Family members/people who speak the same language live here
    3. It is a good place to find a job
    4. It is close to my work
    5. Housing is affordable
    6. It is close to transportation
    7. It is close to schools
    8. I was resettled
    9. Other

    18.1   Reason A _____   18.2   Reason B _____

19. What is <NAME'S> relationship to the head of household?
   1. Head of household
   2. Spouse
   3. Child
   4. Brother
   5. Sister
   6. Parent
   7. Other

[Q20. TO Q22. WILL BE ASKED FOR ALL HH MEMBERS WHO ARE AGED 16 OR MORE, ELSE GOTO Q10.]

20. What is <NAME'S> marital status? Is he (she) . . . .(Read list to respondent)
   1. Never married
   2. Currently married
   3. Widowed
   4. Divorced or separated

21. What is the highest level of education he (she) completed? (Read list to respondent.)
   1. Less than primary school
   2. Primary school
   3. Middle school
   4. High school
   5. 12th grade/Technical training
   6. Graduation
   7. Post graduate degree

22. What is <NAME's> occupation? (Read list to respondent.)
   1. Unskilled worker
   2. fSkilled worker
   3. Petty trader
   4. Shop owner
   5. Businessman with no employees
   6. Businessman with 1-9 employees
   7. Businessman with 10+ employees
   8. Self employed professional
   9. Clerical/Salesman
   10. Supervisor
   11. Officer/Junior executive
   12. Officer/Middle/Senior executive
   13. Housewife
   14. Student
   15. Other _____

[If no more HH Members left then GOTO Q23. ELSE GOTO Q10.]

EDUCATION MODULE

[Q23. TO Q27. WILL BE ASKED FOR ALL HH MEMBERS WHO ARE AGED 5-21, THEN GOTO Q28.]

[If THERE ARE NO HH MEMBERS WHO ARE AGED BETWEEN 5-21, THEN GOTO Q31.]

23. Is <NAME> currently attending school?
   1. Yes **[GO TO Q25.]**
   2. No

24. Why is <NAME> not attending school? (Interviewer selects which of the following best applies.)

        1.   The child is working
        2.   The child failed at school
        3.   The school is too far away
        4.   We don't have the money
        5.   The child is sick or injured
        6.   Other
        [LOOP BACK TO Q23.]

25. What type of school is <NAME> attending?

        Pre-primary
        Primary
        Middle school
        High school
        Technical training
        College

26. Is this school public or private, or a semi-government school?

        Public
        Private
        Semi-government

27. Did you pay a donation to the school?

        Yes
        No
        [LOOP BACK TO Q23.]

EDUCATION MODULE (Contd…)

[AUTO SELECT ONE CHILD AGED 10 OR YOUNGER AND ONE CHILD AGED 11 OR MORE WHO ATTENDS SCHOOL (Q23.=YES) USING KISH TABLE LOGIC]

[IF FOUND NONE GOTO Q31.]

28. How far away is <NAME's> school?

        1.   Less than a 15 minute walk
        2.   A 15-30 minute walk
        3.   A 30-60 minute walk
        4.   More than a one hour walk.
        5.   Don't know [Do not read this option]

29. Where is <NAME's> school located? **[Pull-down list of Section Names]**

30. How does <NAME> usually travel when getting to school? Please describe one complete trip from home to school. [Interviewer codes three most important modes and time taken based upon respondents description of the trip]

1. On foot
2. By bicycle
3. By train
4. By public bus
5. By school bus
6. By auto-rickshaw
7. By taxi
8. By two-wheeler (own vehicle)
9. By own car/jeep/van
10. In someone else's car/jeep/van
11. Other _____

[LOOP FOR THREE MODES A, B & C; THEN GOTO Q31.**]**

30.1   Mode A/B/C: _____

30.2   Time taken _____

If mode is 1, 2, 8 or 9 goto Q30.**1 until all 3 modes done**

If mode is 3, 4 or 5 go to Q30.**3.1 else go to Q**30.**4**

30.3.1 BUS / TRAIN PASS?
1.   YES **[GOTO Q**30.**3.2]**
2.   NO **[GOTO Q**30.**4]**

30.3.2 Duration of Pass
Cost of Pass
[GOTO Q30.**1 until all 3 modes done]**

30.4 Cost of Trip _____
[GOTO Q30.**1 until all 3 modes done]**

LIVELIHOOD MODULE

31. {Display list of household members list > 16years} In terms of this family's livelihood, who is the most important income earner in the household? Who is the second most important income earner? (Select 2 names from the list)

31.1   First Important HH Member   31.2   Second Important HH Member

[Q32. TO Q38. **WILL BE ASKED FOR THE TWO MOST IMPORTANT EARNERS SELECTED ABOVE, THEN GOTO Q**50.**] IF NO EARNERS, GO TO Q.**50.

32. How many jobs does <NAME> have? _____

33. Now I will ask about <NAME's> main job, the one in which he/she spends the most time. What does he/she do in this job?
1.   Street vendor or person who makes goods at home **[GO TO Q**39.**]**
2.   Other

34. Where does <NAME> usually work

34.1   Section ____ **[Pull-down list of 88 Section Names]**

34.2   PIN CODE **[Pull-down list of pin codes]**

35.   Is there public transport available within a 10 minute walk of this location?
                1.   Yes
                2.   No

36.   How does <NAME> usually travel when getting to work? Please describe one complete
        trip from home to work. [Interviewer codes three most important modes and time taken
        based upon respondent's description of the trip]
                1.   On foot
                2.   By bicycle
                3.   By train
                4.   By bus
                5.   By auto-rickshaw
                6.   By taxi
                7.   By two-wheeler (own vehicle)
                8.   By own car/jeep/van
                9.   In someone else's car/jeep/van
                10. ther

[LOOP FOR THREE MODES A, B & C; THEN GOTO Q37]

        36.1   Mode A/B/C: _____

        36.2   Time taken _____

        If mode is 1, 2, 7 or 8 goto Q36.**1 until all 3 modes done**

        If mode is 3 or 4 go to Q36.**3.1 else go to Q**36.**4**

            36.3.1 BUS / TRAIN PASS?
            1.   YES **[GOTO Q**36.**3.2]**
            2.   NO **[GOTO Q**36.**4]**

            36.3.2 Duration of Pass
                   Cost of Pass
                   [GOTO Q36.**1 until all 3 modes done]**

        36.4 Cost of Trip _____
                   [GOTO Q36.**1 until all 3 modes done]**

37. Did <NAME> work full-time at this job last month?
                1.   Yes
                2.   No

38. On average, in what category would you say <NAME'S> monthly earnings fall?   (Read list
        to respondent.)
                1.   0-1,000 Rs.
                2.   1,000-5,000 Rs.
                3.   5,000-10,000 Rs.
                4.   10,000-25,000 Rs.
                5.   > 25,000 Rs.
                6.   Don't know [DO NOT READ TO RESPONDENT.]
                7.   Refused [DO NOT READ TO RESPONDENT.]

[LOOP BACK TO Q31. UNTIL TWO SELECTED MEMBERS COMPLETED then GOTO Q50.**]**

[Q39. TO Q49. WILL BE ASKED IF HH MEMBER IS A STREET VENDOR]
39. Does <NAME'S> work require him to travel?
      1. Yes
      2. No   GOTO Q.49.

40. Does <Name> purchase goods for his work ?
      1. Yes
      2. No   GOTO Q.43.

41. Where is <Name> getting these materials from? **[Pull-down list of Section Names]**
   [If more than one location, ask most frequent.]

42. How does <NAME> usually transposrt these materials? Please describe one complete trip.
   [Interviewer codes three most important modes and time taken based upon respondents
   description of the trip]
      1. On foot
      2. By bicycle
      3. By train
      4. By bus
      5. By auto-rickshaw
      6. By taxi
      7. By two-wheeler (own vehicle)
      8. By own car/jeep/van
      9. In someone else's car/jeep/van
      10. Other

[LOOP FOR THREE MODES A, B & C; THEN GOTO Q.43.]

    42.1   Mode A/B/C: _____

    42.2   Time taken _____

    If mode is 1, 2, 7 or 8 goto Q42.1 until all 3 modes done

    If mode is 3 or 4 go to Q42.3.1 else go to Q42.4

      42.3.1 BUS / TRAIN PASS?
        1. YES **[GOTO Q42.3.2]**
        2. NO **[GOTO Q42.4]**

      42.3.2 Duration of Pass
           Cost of Pass
           [GOTO Q42.1 until all 3 modes done]

      42.4 Cost of Trip _____
           [GOTO Q42.1 until all 3 modes done]

43. Does <NAME> sell goods ? _____
      1. Yes
      2. No   GO TO Q47.

44. Where does <NAME> sell goods ?
  [Pull down list of Sections Names. If more than one location, describe most frequent.]

45. How does <NAME> usually transport these goods? Please describe one complete trip. [Interviewer codes three most important modes and time taken based upon respondents description of the trip]
   1. On foot
   2. By bicycle
   3. By train
   4. By bus
   5. By auto-rickshaw
   6. By taxi
   7. By two-wheeler (own vehicle)
   8. By own car/jeep/van
   9. In someone else's car/jeep/van
   10. Other

[LOOP FOR THREE MODES A, B & C; THEN GOTO Q46.]

   45.1   Mode A/B/C: _____

   45.2   Time taken _____

   If mode is 1, 2, 7 or 8 goto Q45.1 until all 3 modes done

   If mode is 3 or 4 go to Q45.3.1 else go to Q45.4

   45.3.1 BUS / TRAIN PASS?
      1. YES **[GOTO Q45.3.2]**
      2. NO **[GOTO Q45.4]**

   45.3.2 Duration of Pass
      Cost of Pass
      [GOTO Q45.1 until all 3 modes done]

   45.4 Cost of Trip _____
      [GOTO Q45.1 until all 3 modes done]

46. Does <NAME> own his own cart for selling goods ?
   1. Yes
   2. No

47. I will read a list of problems that <NAME> might face in transporting goods purchased or sold. Please tell me whether or not each one is a probem:
   1. The roads are in poor condition [Y/N]
   2. Transport services are unreliable [Y/N]
   3. It is difficult to transport the cart [Y/N]
   4. Goods may be stolen [Y/N]

[If only one problem , go to Q49.]

48. Please list the problems in order of importance. Palm will allow interviewer to rank 1, 2, 3, etc.]

49. On average, in what category would you say <NAME'S> monthly earnings fall?   (Read list to respondent.)
        1.   0-1,000 Rs.
        2.   1,000-5,000 Rs.
        3.   5,000-10,000 Rs.
        4.   10,000-25,000 Rs.
        5.   > 25,000 Rs.
        6.   Don't know [DO NOT READ TO RESPONDENT.]
        7.   Refused [DO NOT READ TO RESPONDENT.]

[LOOP BACK TO Q31. **FOR 2 MOST IMPORTANT EARNERS]**

HEALTH MODULE

50. Now I'm going to ask you how easy it is to reach health care from your home. How far away is the nearest private doctor from your home? (Read list to respondent.)
        1.   Less than a 10 minute walk...
        2.   A 10-20 minute walk..
        3.   A 21-30 minute walk.
        4.   More than a half hour walk.
        5.   Don't know [DO NOT READ]

51. How far away is the nearest clinic from your home? (Read list to respondent.)
        1.   Less than a 10 minute walk..
        2.   A 10-20 minute walk.
        3.   A 21-30 minute walk..
        4.   More than a half hour walk..
        5.   Don't know [DO NOT READ]

52. How far away is the nearest Municipal Hospital from your home?   (Read list to respondent.)
        1.   Less than a 15 minute walk.
        2.   A 15-30 minute walk.
        3.   A 30-60 minute walk.
        4.   More than an hour walk.
        5.   Don't know [DO NOT READ]

53. How far away is the nearest Private Hopsital or Nursing Home from your home? (Read list to respondent.)
        1.   Less than a 15 minute walk.
        2.   A 15-30 minute walk.
        3.   A 30-60 minute walk.
        4.   More than an hour walk
        5.   Don't' know [DO NOT READ]

54. Now suppose you were to become seriously ill—so ill that you immediately required a doctor's attention. Which one of the following providers would you go to for treatment? (Read list to respondent.)
        1.   Private Doctor
        2.   Clinic
        3.   Municipal Hospital
        4.   Private Hospital/ Nursing Home

55. Where is this located? **[Pull-down list of Section Names]**

56. How would you go there? Please describe one complete trip. [Interviewer codes three most important modes and time taken based upon respondents description of the trip]
   1. On foot
   2. By bicycle
   3. By train
   4. By bus
   5. By auto-rickshaw
   6. By taxi
   7. By two-wheeler (own vehicle)
   8. By own car/jeep/van
   9. In someone else's car/jeep/van
   10. Other

[LOOP FOR THREE MODES A, B & C; THEN GOTO Q57.]

   56.1   Mode A/B/C: _____

   56.2   Time taken _____

   If mode is 1, 2, 7 or 8 goto Q56.1 until all 3 modes done

   If mode is 3 or 4 go to Q56.3.1 else go to Q56.4

      56.3.1 BUS / TRAIN PASS?
         1. YES **[GOTO Q56.3.2]**
         2. NO **[GOTO Q56.4]**

      56.3.2 Duration of Pass
             Cost of Pass
             [GOTO Q56.1 until all 3 modes done]

   56.4 Cost of Trip _____
         [GOTO Q56.1 until all 3 modes done]

57. Which of the following describe your reason for going to this particular health care provider ? (Read list to respondent and check all that apply.)
   1. It is the nearest to home
   2. It is inexpensive
   3. It provides better care
   4. Other reason

[If there are no children 10 or under, go to Q62.]

58. Suppose that one of your children were seriously ill—so ill that they required immdediate attendtion from a doctor. Which one of the following providers would you go to for treatment? (Read list to respondent.)
   1. Private Doctor
   2. Clinic
   3. Municipal Hospital
   4. Private Hospital/ Nursing Home

59. Where is this located? **[Pull-down list of Sections Names]**

60. How would you go there? Please describe one complete trip. [Interviewer codes three
most important modes and time taken based upon respondents description of the trip]
1. On foot
2. By bicycle
3. By train
4. By bus
5. By auto-rickshaw
6. By taxi
7. By two-wheeler (own vehicle)
8. By own car/jeep/van
9. In someone else's car/jeep/van
10. Other

[LOOP FOR THREE MODES A, B & C; THEN GOTO Q61.]

60.1   Mode A/B/C: _____

60.2   Time taken _____

If mode is 1, 2, 7 or 8 goto Q60.1 until all 3 modes done

If mode is 3 or 4 go to Q60.3.1 else go to Q60.4

60.3.1 BUS / TRAIN PASS?
1. YES **[GOTO Q60.3.2]**
2. NO **[GOTO Q60.4]**

60.3.2 Duration of Pass
Cost of Pass
[GOTO Q60.1 until all 3 modes done]

60.4 Cost of Trip _____
[GOTO Q60.1 until all 3 modes done]

61. Which of the following describe your reason for going to this particular health care
provider ? (Read list to respondent and check all that apply.)
1. It is the nearest to home
2. It is inexpensive
3. It provides better care
4. Other reason

TRANSPORTATION MODULE

62. Now I'm going to ask you how far public transportation is from your home.   How far is
the nearest bus stop from your home? (Read list to respondent.)
1. Less than one kilometer
2. Between one and two kilometers
3. Between two and four kilometers
4. More than four kilometers
5. Don't know [DO NOT READ.]

63. How long would it take a person to walk to this bus stop from your home? (Read list to
respondent.)

1. Less than 5 minutes
2. 5-10 minutes
3. 10-20 minutes
4. 20-30 minutes
5. More than 30 minutes
6. Don't Know [DO NOT READ]

64. How reliable is the bus service? Is it …. (Read list to respondent.)
1. Very reliable
2. Somewhat reliable
3. Unreliable
4. Don't Know [DO NOT READ]

65. Now I am going to ask you how you feel about the bus service in Mumbai. How do you feel about the amount of crowding on buses in Mumbai? (Read list to respondent.)
1. Satisfied
2. Neutral (neither satisfied nor dissatisfied)
3. Dissatisfied

66. How safe do you feel when riding buses in Mumbai? (Read list to respondent.)
1. Very safe
2. Neutral (neither very safe nor very unsafe)
3. Unsafe

67. How convenient are the bus routes in Mumbai for you—do they go to the places you wish to go? (Read list to respondent.)
1. Very convenient
2. Neither convenient nor inconvenient
3. Not very convenient

68. How satisfied are you with the frequency of bus service--with how often buses come? (Read list to respondent.)
1. Satisfied
2. Neutral (neither satisfied nor dissatisfied)
3. Dissatisfied

69. How far is the nearest railway station from your home? Is it…. (Read list to respondent.)
1. Less than one kilometer
2. Between one and two kilometers
3. Between two and four kilometers
4. More than four kilometers
5. Don't Know [DO NOT READ] ……….

70. How long would it take a person to walk to this railway station from your home? (Read list to respondent.)
1. Less than 5 minutes
2. 5-10 minutes
3. 10-20 minutes
4. 20-30 minutes
5. More than 30 minutes
6. Don't Know [DO NOT READ]

71. How reliable is the train service. Is it (Read list to respondent.)

1. Very reliable
2. Somewhat reliable
3. Unreliable
4. Don't Know [DO NOT READ]

72. Now I am going to ask you how you feel about the train service in Mumbai. How do you feel about the amount of crowding on trains in Mumbai? (Read list to respondent.)
    1. Satisfied
    2. Neutral (neither satisfied nor dissatisfied)
    3. Dissatisfied

73. How safe do you feel when riding trains in Mumbai? (Read list to respondent.)
    1. Very safe
    2. Neutral (neither very safe nor very unsafe)
    3. Unsafe

74. How convenient are the train routes in Mumbai for you? Do they go to the places you wish to go? (Read list to respondent.)
    1. Very convenient
    2. Neither convenient nor inconvenient
    3. Not very convenient

75. How satisfied are you with the frequency of train service—with how often trains come? (Read list to respondent.)
    1. Satisfied
    2. Neutral (neither satisfied nor dissatisfied)
    3. Dissatisfied

76. How far from your home you would you have to go to catch a taxi? [SAY auto-rickshaw for suburbs and taxi for downtown Mumbai.]
    1. Less than one kilometer
    2. Between one and two kilometers
    3. Between two and four kilometers
    4. More than four kilometers
    5. Don't Know [DO NOT READ]

77. How long would it take a person to walk from your home to catch a taxi? (Read list to respondent.)
    1. Less than 5 minutes
    2. 5-10 minutes
    3. 10-20 minutes
    4. 20-30 minutes
    5. More than 30 minutes
    6. Don't Know [DO NOT READ]

78. How reliable the taxi service is in your neighborhood? How frequently do the taxis come? (Read list to respondent.)
    1. Very frequently
    2. Somewhat frequently
    3. Not very frequently
    4. Don't Know [DO NOT KNOW]

79. Now I'd like to ask you about the condition of roads in your neighborhood. Is there a road through this neighborhood ?
    1. Yes
    2. No **[GO TO Q**82.**]**

80. Can motor vehicles drive on the road all year long (even during monsoons)?
    1. Yes **[GO TO Q82.]**
    2. No

81. Can motor vehicles drive on the road when the weather is dry?
    1. Yes
    2. No

82. Does your neighborhood have footpaths that you can use ?
    1. Yes
    2. No

83. Were there places you wanted to go in the past week but couldn't get to ?
    1. Yes
    2. No **[GO TO Q86.]**

84. Which of the following places couldn't you get to? [Interviewer read list and check all that apply.]
    1. Places to shop
    2. Relatives' house
    3. Doctor or hospital
    4. Work related places
    5. Education related places
    6. Other

85. Why couldn't you get to them? [Interviewer read list and check all that apply.]
    1. Lack of money
    2. No bus or train line nearby
    3. Too far to walk
    4. Not enough time
    5. I am disabled
    6. Other

HOUSING MODULE

86. Housing Category by Housing Delivery System [Enumerator to observe. If unsure about 6. ask "Is this housing provided by your employer?"]
    1. Non-notified squatter settlement
    2. Notified squatter settlement
    3. Resettlement
    4. Chawls
    5. Cooperative housing
    6. Employer housing (govt. or private)
    7. Bungalow
    8. Other

87. Type of dwelling unit [Enumerator to observe.]
    1. Free-standing house
    2. Attached house
    3. Flat/apartment

88. What is the <u>predominant material of the floors?</u> [Enumerator to observe.]

1. Mud
2. Wood
3. Brick
4. Stone
5. Cement
6. Mosaic/Floor Tile
7. Other

89. What is the <u>predominant material of exterior walls?</u> [Enumerator to observe.]

1. Grass/thatch
2. Plastic/polyethylene
3. Wood
4. Mud/Unburnt brick
5. Metal/asbestos sheets
6. Burnt brick
7. Stone
8. Concrete
9. Other

90. What is the <u>predominant material of the roof?</u> [Enumerator to observe.]

1. Grass/thatch/wood/mud
2. Plastic/polyethylene
3. Tiles
4. Slate
5. Metal/asbestos sheets
6. Brick
7. Stone
8. Concrete
9. Other

91. Area occupied by the household for living space _____ sq. ft. [Enumerator to observe. If necessary, ask "How big is your house in square feet?"]

92. Number of rooms in dwelling unit, excluding bathrooms and kitchen. [Enumerator to observe. If necessary, ask "Not including the bathroom and kitchen, how many rooms are in your house?"]

93. Separate kitchen [Enumerator to observe. If necessary, ask "Do you have a separate kitchen (one that is a separate room in the house)?]
    1. Within house-separate kitchen
    2. No separate kitchen

94. Whether there is a toilet inside the house. [Enumerator to observe. If necessary, ask "Do you have a toilet inside your house?"]
    1. Yes
    2. No

95. Separate bathroom inside the house [Enumerator to observe. If necessary, ask "Do you have a separate bathroom (one that is a separate room inside the house)?"]
    1. Separate bathroom within the house
    2. No separate bathroom

96. Whether piped water connection inside the house [Enumerator to observe. If necessary, ask "Do you have a water tap inside the house?"]
    1. Yes
    2. No

97. Do you own this house?
    1. Yes **[GO TO Q**100.**]**
    2. No

98. How much do you pay each month for rent? (Rs.)

99. How much was the monthly rent when you first moved here? (Rs.) **[GO TO Q101.]**

100. Is there any payment you make each month to live here? (Includes mortgage payments.) If so, how much do you pay each month?

101. Can you tell me what a house (apartment) like yours would sell for in this neighbourhood?   (Rs.) _____

102. Can you tell me what a house (apartment) like yours in this neighbourhood would rent for each month?

CONSUMPTION MODULE

We'd like to know how the amount you spend on transportation compares with what you spend on other goods. So, I'm going to ask you how much you spend on different things.

103. Does your household cook at home?
    1. Yes
    2. No **[GO TO Q**106.**]**

Now I'm going to ask whether your household buys any of the following items. If you do buy them, I'll ask you how much of each item you usually buy every two weeks and how much you spend on each item. {Interviewer to decide whether to ask for aggregate or individual values}

104. Did your household consume the following cereals <item- *read from list below*> in the last fortnight? If Yes, ask for quantity, units and fortnightly expenditure OR the aggregate values.
1. Chira / Poha
2. Suji/Rava
3. Maida
4. Wheat
5. Rice
6. Maize/Makka
7. Bajra
8. Jowar
9. Other cereals
10. Total Cereals

104.1 Quantity/Unit(gms/kgs)   104.2 Cost(Rs) for each item

[If unable to get individual info then display screen for getting aggregate for all cereals; quantity and cost]

105. Did your household consume the following pulses <item- *read from list below*> in the last fortnight? If Yes, ask for quantity, units and fortnightly expenditure OR the aggregate values.
1. Moong
2. Masoor
3. Arhar
4. Urad
5. Channa dal
6. Mixed dal
7. Rajma
8. Gram
9. all others
10. Total pulses

105.1 Quantity/Unit(gms/kgs)   105.2 Cost(Rs) for each item

[If unable to get individual info then display screen for getting aggregate for all Pulses; quantity and cost]

106. Did your household consume the following food items <item- *read from list below*> in the last week? If Yes, ask for weekly total expenses.
1. Meat
2. Fish
3. Eggs
4. Vegetables
5. Fruits
6. Milk/milk products (Curd, raita, butter, milk powder and baby formula)
7. Beverages (non-alcoholic, incl. tea, coffee, sodas; but excluding water)
8. Sweets, candies, biscuits
9. Purchased bread (chapatis, nan, bun, etc.)
10. Alcoholic drinks incl. Beer
11. Canned food
12. _____
13. _____
14. _____

106.1 Weekly expenses(Rs) for each item

107. How much did you spend on the following items <item- *read from list below*> in the last month? If Yes, ask for monthly total expenses.

Food Staples
1. Besan
2. Desi ghee
3. Cooking oil
4. Sugar, salt and spices

Hygiene products / services
1. Toothpaste
2. Shampoo and Soap
3. Cosmetics and hair oil
4. Shaving supplies

Personal services
5. Haircuts
6. Beauty treatment
7. Facial/massage
8. Household cleaning products and toilet supplies
9. Wages paid to domestic help (cook, maid, watchman, driver, car cleaners, sweepers, etc.)

Transport, communication and recreation
10. Fuel (own vehicle)
11. Public bus or contracted carriage
12. Rail fare
13. Inter-mediate public transport (taxi, auto, six-seater, and cycle-rickshaw)
14. School bus
15. Communication (telephone bills, postal expenses, Internet access fees, cable subscriptions)
16. Recreation and entertainment (cinema, sports goods, sports club fees, gym membership, etc.)

Household support services
17. Repayment of loan/installments of goods purchased on hire purchase
18. Repayment of other loans (informal, credit cards, etc.)
19. Electricity payments
20. Payments for water, sewer services

107.1 Weekly expenses(Rs) for each item

108. How much did your household spend on the following <item- *read from list below*> in the last week?
1. Meals (breakfast, lunch, dinner) outside home
2. Drinks (incl. alcohol) and snacks outside home
3. Tobacco, cigarettes, cigars, bidi, etc.
4. Lottery tickets
5. Regular worship, alms, etc.
6. Newspapers & magazines purchased on street

[DO NOT BREAK DOWN EXPENDITURE BY HOUSEHOLD MEMBER.]

108.1 Weekly expenses for each item (Rs)

109. How much did your household spend on the following <item- *read from list below*> in the last YEAR?

1.Clothing and footwear (incl. Materials, tailoring)
Education
   School fees
            2.Tuition fees
         3.   Books
         4.   Uniform
         5.   Total   [Auto Calculated]
      6. Private tuition and coaching
      7. College fees
      8. Books, stationary and journals
      9. Boarding / hostel fees
      10. Others (examination or application fees, etc.)
      11. Scholarships and financial aid received
      12. Total   [Auto Calculated]
   Medical Care
      13. Medical care including doctors fees, tests etc
      14. Medicines and eyeglasses
      15. Hospitalization
   Asset Development/Maintenance/Festivities
      16. Annual house repair and maintenance
      17. Vehicle repair and maintenance
      18. Vehicle ownership costs (Car loan payments)
      19. Non Motorized Transport (NMT) repair and maintenance
      20. Insurance (including Life, Vehicle, Mediclaim etc)
      21. Ceremonies (Weddings, Funerals, Dowry, Wedding gifts, Birthday gifts etc.)
      22. Donations at festivals (Ganpati, Navaratri etc.)
      23-25. Other major non-food expenditures

   109.1   Annual expenditure (Rs) (for each of above heads)

Durable goods / household assets

110.   Please tell me if your household owns any of the following assets. [Note: First go through list and record number of each item. Then get other information for each item. If household owns more than one unit of an item, note how many.]
110.1.1   YES=1 and NO=2   110.1.2   Number of items for each of the above
      Furniture
         1 Bedstead
         2 almirah, dressing table
         3 chair, stool, bench, table
         4 suitcase, trunk, box, handbag and other travel goods
         5 foam, rubber cushion (dunlopillo type)
         6 carpet, daree & other floor mattings
         7 paintings, drawings, engravings etc.
   goods for recreation
         8 gramophone & record player
         9 Radio
         10 tape recorder, CD player
         11 Television
         12 VCR/VCP
   household appliances
         13 electric fan
         14 air conditioner
         15 sewing machine
         16 washing machine

17 stove

18 pressure cooker/pressure pan

19 Computer

20 Refrigerator

personal transport equipment

21 Bicycle

22 motor cycle, scooter

23 motor car, jeep

111. On average, in what category would you say your household's monthly income falls?
(Enumerator to explain that this is income of all members of the household put together)
1. Below Rs. 5,000
2. Rs. 5,001 to 7,500
3. Rs. 7,501 to 10,000
4. Rs. 10,001 to 15,000
5. Rs. 15,001 to 20,000
6. Rs. 20,001 to 25,000
7. Rs. 25,001 to 50,000
8. Rs. 50,001 to 75,000
9. Rs. 75,001 and above
10. Don't Know (Enumerators DO NOT READ THIS to respondent)

Questionnaire Development

A household questionnaire and travel diary were drafted based on household surveys administered by one of the authors (Somik Lall) in other cities in India. These drafts were modified based on 6 focus groups conducted in Mumbai in August of 2004, on the comments of the enumerators during training sessions, and on one-on-one interviews conducted with approximately 20 households. Most changes in the survey were aimed at making it easier for respondents to report information: Open-ended questions (e.g., asking distance from an origin to a destination) were replaced by a series of intervals; destinations were coded using neighbourhoods and pin codes rather than by requiring street addresses.

After the questionnaire was revised, we conducted two 100 household pre-tests and made further revisions to the questionnaire. The pre-tests revealed that our consumption module required 30-40 minutes of time to complete; hence, we decided to correlate information provided by this module for the first 500 households with income information to see if the module could be dropped from the survey.

Technology Used

A Palm Pilot® based mobile device was used to collect and record the survey data. The questionnaire was programmed into the Palm, and responses to the travel diary were also recorded by enumerators in the Palm, although paper versions of the travel diary were distributed to households. In the Palm, responses to most questions were listed in the form of drop-down menus. Enumerators were able to read the questions and record responses directly in the Palm.

The questionnaire was divided into logical modules which could be answered independently while maintaining the logical sequence of questions within a module. The software automatically took care of the logical skip patterns and looping of questions. The program also checked responses for logical correctness, refusing answers that were implausible or clearly incorrect. This helped to reduce errors in recording survey responses.

Field Work Organization

The field work was contracted to a local firm (MaRS Ltd.) with experience in carrying out household surveys. The survey took approximately 4 months to implement with 17 enumerators and three supervisors. The work was organized as follows:

Field Staff Training – All field staff received extensive training, with separate sessions on the use of the Palm. The training covered survey objectives, methodology,

interviewing techniques, a detailed discussion of the content and purpose of the questionnaire, and practice sessions in the field. A survey manual was developed and distributed to all field staff.

Field Teams – The data were collected by 3 field teams, each consisting of 5-6 members. Each team was responsible for a particular set of enumeration blocks. The assignment of blocks to the various teams was done to balance work load and travel time across teams: on average each enumerator covered 2.4 households a day.

Field Testing – Field testing, in the form of one-on-one interview and pre-tests, was conducted to determine the following:
- Appropriateness of the instrument (including the Palm technology)
- Length/timing of the interviews
- Wording/phrasing
- Level of cooperation from respondents
- Ability of the enumerators to carry out the study

The survey instrument was adjusted appropriately after the field testing.

Structure of the Interviews: The interviews were conducted in Hindi or Marathi. Each household was visited twice. During the first visit, the interviewer completed the main survey module. Hard copies of the travel diaries were left behind, which were collected by the enumerator two days later. (The day after administration of the main questionnaire was designated the travel day.)

At the end of each day the enumerators transferred the data collected in the Palm into a small removable memory chip, which was used as a secure backup device. Data from the enumerator's memory chip were transferred to a supervisor's hand-held device. The supervisor could also backup all the data collected from enumerators into his/her own memory chip for additional backup and secure storage. The consolidated survey data from the supervisors' Palms were downloaded to PCs and transferred electronically to the World Bank twice weekly.

Replacement Households: If a household was not found, or refused to respond, it was replaced by another household in the EB. The replacement household was selected from the listing of all households in the ward on the basis of a pre-determined random procedure.

Lessons Learned in Survey Implementation

The implementation of this survey provided several lessons which may be useful to other practitioners considering such a study. First, it would have been useful to have more information on the labor market history of individuals, and on housing mobility. One of the benefits of a transit system is that it gives people access to better housing and jobs. To measure the long-term benefits of transit improvements requires an assessment of how mobile people are in terms of where they live and work. Second, the income categories could have been more finely disaggregated, particularly at the bottom end of

the income distribution. Third, it was particularly difficult to obtain access to respondents in the higher income households. This required a special letter of introduction from City Officials, and several visits to the households. This additional effort should be accounted for in planning the field work. Finally, the focus groups, which were organized by local NGOs, at times became somewhat 'political'. It is important to ensure that such opportunities for information gathering avoid advocacy of any kind to obtain the most accurate data from the participants as possible.

Appendix C
Comparison of Sampled Households with NSS Households

A comparison of our sample households and the 1,618 households in Mumbai who were sampled in the 55th round of the National Sample Survey, conducted in July 1999 through June 2000 reflects some similarities and differences. The households in our survey are almost identical in religious composition to those in the NSS (see Table C-1): three-quarters are Hindu and one-sixth are Muslim. Our households differ, however, from those in the NSS in size, characteristics of the household head, and income.

Our sample has fewer single-person households and fewer very large households compared to the NSS. As Table C-2 indicates, only 1.1% of our households are single-person households, compared to 15.3 % in the NSS, and only 6.6% of our households are larger than 6 persons, compared to 14.5% in the NSS. Not surprisingly, we also have more currently married household heads (91% v. 82%, see Table C-5) and more prime-aged heads of household (those in their 30s, 40s and 50s) than the NSS (see Table C-4). The source of these discrepancies is likely due to differences in the populations sampled. The NSS covers "inmates (including residential staff) of a hostel, mess, hotel, boarding and lodging house, etc.", who are likely to constitute a single member household. It also covers "households residing in open space, roadside shelter, under a bridge etc., more or less regularly in the same place". Both of these categories are not covered in our survey. The NSS definition of a household is also slightly different from ours as it includes resident employees, domestic servants, or paying guests, which will contribute towards larger household sizes.

There are also differences in educational attainment among household heads in the two samples. (See Table C-6.) There is not a one-to-one correspondence between education categories in the two surveys; however, if we assume an illiterate person would have at most a primary education, 38% of head of households in the NSS are estimated to have completed primary education or less, whereas only 10% of our household heads fall in this category. In contrast, 58% of our household heads have completed middle or high school, whereas only 38% of household heads in the NSS have achieved this education level.

This difference in educational attainment would be expected to result in fewer very poor households in our sample. Since the NSS measures consumption expenditures and we have only household income intervals, a direct comparison of incomes is difficult. The following argument, however, suggests that our households are, on average, better off than those in the NSS. Based on the NSS, the Indian government Planning Commission estimates the poverty line for urban Maharashtra as Rs. 594 per month per capita, which translates into Rs. 2,793 in 2004 for an average household of 4.3 persons. We also know the population under the poverty line in 1999-2000 for the same region is 26.8%, which is about the same as the share of households with an income of Rs. 5,000 or less in our sample. Since it is difficult to believe that households reported to earn Rs. 5,000 or less spend only Rs. 2,793, it appears that we have a less poor sample than the NSS.

Table C-1 Religion

	Our survey		NSS	
	Freq.	**Percent**	**Sample Obs**	**Percent**
Hindu	3,738	75.2	1,211	75.4
Muslim	820	16.5	251	16.4
Christian	165	3.3	66	3.9
Sikh	19	0.4	4	0.2
Buddhist	131	2.6	29	1.6
Jain	68	1.4	43	1.7
Other	33	0.7	13	0.8
Total	4,974	100	1,617	100

Table C-2 Household Size

	Our survey		NSS	
	Freq.	**Percent**	**Sample Obs**	**Percent**
1	57	1.1	263	15.3
2	378	7.6	134	7.9
3	857	17.2	192	11.7
4	1,615	32.4	354	23.6
5	1,238	24.9	286	16.6
6	509	10.2	170	10.5
7	167	3.4	94	6.2
>8	159	3.2	125	8.3
Total	4,980	100	1618	100

Table C-3 Gender of the Head of Household

	Our survey		NSS	
	Freq.	**Percent**	**Sample Obs**	**Percent**
M	4,756	95.5	1,479	92.0
F	224	4.5	139	8.0
Total	4,980	100	1,618	100.0

Table C-4 Age of the Head of Household

	Our survey		NSS	
	Freq.	**Percent**	**Sample Obs**	**Percent**
10-19	16	0.3	42	2.5
20-29	633	12.7	290	17.7
30-39	1,742	35.0	418	27.2
40-49	1,584	31.8	392	24.3
50-59	769	15.4	260	15.4
60-69	198	4.0	156	9.1
70-79	34	0.7	51	3.1
>80	4	0.1	9	0.7
Total	4,980	100	1,618	100

Table C-5 Marital Status of the Head of Household

	Our survey		NSS	
	Freq.	**Percent**	**Sample Obs**	**Percent**
Never married	325	6.5	162	9.7
Currently married	4,522	90.8	1,303	81.5
Widowed	120	2.4	145	8.3
Divorced / Separated	13	0.3	8	0.5
Total	4,980	100	1,618	100.0

Table C-6 Education of the Head of Household

	Our survey		NSS	
	Freq.	**Percent**	**Sample Obs**	**Percent**
Not literate			190	12.1
Literate through other program			11	0.8
<Primary	258	5.2	186	11.3
Primary	258	5.2	211	13.7
Middle school	1,220	24.5	279	17.2
High school	1,636	32.9	362	20.8
12th grade/Technical training	709	14.2	123	8.1
College	665	13.4	256	16
Post graduate	234	4.7		
Total	4,980	100	1618	100.0

Appendix D
Additional Tables

Table D-1 Work location by Residential Location and Income

	Home	Work At home	1	2	3	4	5	6	Outside of GMR	Not Fixed	Total
HH income <5k	1	10.3	79.4	5.9	2.9	0.0	0.0	0.7	0.7	0.0	100
	2	6.1	13.9	74.6	2.4	0.0	0.6	1.2	1.2	0.0	100
	3	5.3	2.5	3.9	76.9	2.9	3.9	0.4	0.7	3.6	100
	4	10.3	6.9	1.0	20.7	55.2	0.0	0.3	1.4	4.1	100
	5	1.8	6.2	4.7	3.3	0.0	62.0	5.1	4.0	12.8	100
	6	2.5	8.3	6.6	5.0	12.0	2.9	49.4	5.8	7.5	100
	Total	5.8	14.1	12.6	22.0	14.2	13.6	10.0	2.5	5.4	100
HH income 5k-7.5k	1	10.9	76.5	4.9	4.4	0.6	1.1	1.1	0.6	0.0	100
	2	8.3	16.2	66.2	4.6	1.7	1.0	0.3	1.7	0.0	100
	3	3.8	4.7	6.0	78.0	2.5	0.6	0.6	0.3	3.5	100
	4	10.6	9.4	4.7	17.0	50.4	0.3	0.6	2.4	4.7	100
	5	3.3	8.5	5.9	7.2	0.7	55.6	7.2	5.6	6.2	100
	6	2.9	12.7	7.8	9.3	14.7	3.2	40.5	3.8	5.2	100
	Total	6.3	17.0	16.1	21.3	13.3	10.5	9.4	2.5	3.6	100
HH income 7.5k-10k	1	9.3	73.9	6.8	4.4	1.2	1.9	1.9	0.6	0.0	100
	2	3.3	22.1	58.8	7.4	3.3	1.5	1.5	2.2	0.0	100
	3	4.7	8.6	5.8	69.1	5.0	0.7	1.4	0.4	4.3	100
	4	8.1	8.1	3.5	20.9	51.7	0.4	0.8	3.5	3.1	100
	5	0.9	12.3	12.3	8.5	1.9	47.2	9.4	2.4	5.2	100
	6	5.3	15.6	9.9	6.1	14.1	4.2	34.2	6.1	4.6	100
	Total	5.1	20.1	17.2	21.3	13.8	8.4	8.5	2.6	3.0	100
HH income 10k-20k	1	5.5	75.9	4.1	3.6	1.4	1.4	6.4	1.4	0.5	100
	2	7.3	22.3	51.2	8.5	1.2	2.7	1.2	5.8	0.0	100
	3	4.8	10.3	4.0	70.0	6.6	2.6	0.4	0.0	1.5	100
	4	6.2	14.6	6.2	25.7	40.3	0.4	1.3	3.5	1.8	100
	5	2.3	6.8	12.5	11.4	0.0	51.1	4.6	6.8	4.6	100
	6	7.1	15.2	8.5	8.5	17.4	3.6	30.4	5.8	3.6	100
	Total	5.9	25.3	15.3	23.9	11.9	5.5	7.2	3.5	1.6	100
HH income >20k	1	6.2	72.3	6.2	6.2	1.5	0.0	3.1	4.6	0.0	100
	2	5.1	42.4	39.0	6.8	0.0	1.7	1.7	3.4	0.0	100
	3	9.1	10.1	6.1	66.7	4.0	3.0	1.0	0.0	0.0	100
	4	6.8	15.9	9.1	26.5	30.3	2.3	1.5	7.6	0.0	100
	5	0.0	20.6	8.8	5.9	5.9	41.2	2.9	11.8	2.9	100
	6	6.4	19.1	6.4	12.7	25.4	6.4	15.9	7.9	0.0	100
	Total	6.4	27.0	11.5	26.3	13.9	5.5	3.8	5.3	0.2	100

Table D-2 Mean Travel Time (minutes) by Purpose and Main Mode

	Work	Shopping	School	Social Visit	Entertain-ment	Health Care	Personal	Total
On foot	12	11	16	12	13	9	15	13
Bicycle	18	NA	NA	NA	NA	NA	17	18
Train	59	38	45	58	63	NA	52	58
Public Bus	39	27	33	37	35	34	40	38
Auto-Rickshaw	15	15	15	17	22	15	22	17
Taxi	23	18	NA	30	23	11	25	24
Two-Wheeler	20	18	14	24	24	NA	20	21
Own Car	28	NA	NA	17	33	NA	33	29
Other's car	65	NA	NA	41	29	NA	NA	42
Total	28	13	24	24	22	15	26	25

Table D-3 Mean Travel Distance (km) by Purpose and Main Mode

Purpose	Work	Shopping	School	Social Visit	Entertain-ment	Health Care	Personal	Total
On foot	1.7	1.5	1.6	1.3	1.4	1.7	1.8	1.6
Bicycle	2.3	NA	NA	NA	NA	NA	3.0	2.3
Train	15.3	10.3	10.6	12.6	14.0	NA	13.3	14.7
Public Bus	4.9	3.1	3.7	4.5	4.2	4.1	5.2	4.6
Auto-Rickshaw	2.7	2.6	2.2	2.9	3.2	2.7	3.1	2.8
Taxi	4.4	1.7	NA	3.8	2.4	1.3	3.7	3.2
Two-Wheeler	3.8	3.1	2.0	3.8	4.0	NA	3.5	3.7
Own Car	5.6	NA	NA	2.0	7.6	NA	6.0	5.7
Other's car	6.9	NA	NA	5.4	6.3	NA	NA	5.9
Total	5.3	1.8	3.5	3.4	3.1	2.3	4.3	4.3

Table D4 Main Mode to School by distance to School for Other HHs (column %)

		<15	15-30	30-60	>60	Don't know	Total
5-7.5k	On foot	97	75	24	3	5	76
	Bicycle	0	2	2	0	0	1
	Train	0	1	13	39	73	5
	Public Bus	1	13	42	48	14	11
	School Bus	0	3	12	7	5	3
	Auto-Rickshaw	1	4	6	0	0	2
	Two-Wheeler	0	2	0	0	0	1
	Own Car	0	0	0	0	0	0
	Other	0	0	0	3	5	0
7.5-10k	On foot	95	65	8	4	0	70
	Bicycle	0	4	0	0	0	1
	Train	0	2	13	46	72	7
	Public Bus	1	10	63	26	22	12
	School Bus	1	11	13	11	0	6
	Auto-Rickshaw	1	5	1	4	0	3
	Taxi	0	0	1	1	0	0
	Two-Wheeler	1	3	1	1	0	1
	Other's car	0	0	0	6	0	0
	Other	0	0	0	0	6	0
10-20k	On foot	91	30	3	0	13	46
	Bicycle	1	4	0	0	0	2
	Train	0	0	19	47	44	8
	Public Bus	1	20	45	34	31	17
	School Bus	3	28	23	13	0	16
	Auto-Rickshaw	3	10	3	4	0	6
	Two-Wheeler	0	5	5	1	0	3
	Own Car	1	1	0	0	0	1
	Other's car	0	1	2	0	6	1
	Other	0	0	0	0	6	0
>20k	On foot	86	19	10	0	0	41
	Bicycle	1	2	0	0	0	1
	Train	0	0	19	29	44	8
	Public Bus	4	14	19	21	22	12
	School Bus	1	40	43	18	11	21
	Auto-Rickshaw	1	17	0	11	0	7
	Two-Wheeler	4	3	5	18	22	7
	Own Car	1	5	0	4	0	3
	Other	0	0	5	0	0	1

Table D-5 Mean Out of Vehicle Time by Residential Zone and Income

	Zone	<5k	5k-7.5k	7.5k-10k	10k-20k	>20k	Total
Rail Commuter	1	8.4	8.5	13.8	8.9	3.3	9.9
	2	14.0	13.6	13.0	9.0	7.0	11.9
	3	19.3	16.8	14.9	14.2	4.8	15.6
	4	16.3	17.6	13.1	11.6	8.6	13.7
	5	17.1	14.8	16.2	12.3	18.8	15.6
	6	18.9	15.6	16.2	14.0	16.1	16.0
	Total	16.9	15.4	14.7	11.7	9.9	14.2
Bus commuter	1	2.2	2.9	2.7	2.6	1.0	2.6
	2	1.6	2.1	2.5	3.3	3.5	2.5
	3	6.3	5.8	7.3	8.2	7.0	6.8
	4	14.0	8.0	9.7	8.0	9.1	9.7
	5	7.5	7.4	11.0	7.7	9.3	8.7
	6	10.1	10.8	10.6	8.6	11.6	10.2
	Total	6.9	6.3	7.4	6.1	7.4	6.7

Table D-6 Opinion on Bus Service by Zone

		1	2	3	4	5	6	Total
Reliability	Positive	59	67	65	68	57	65	64
	Neutral	35	32	32	25	34	26	30
	Negative	6	1	3	7	9	9	6
Crowding	Positive	33	44	33	15	48	44	35
	Neutral	49	37	27	19	30	24	30
	Negative	17	18	41	66	22	33	35
Safety	Positive	52	64	66	69	76	76	67
	Neutral	33	27	29	24	19	20	25
	Negative	15	9	6	6	5	5	7
Convenience	Positive	60	70	72	74	66	64	69
	Neutral	28	25	23	18	28	24	24
	Negative	12	5	5	7	6	12	7
Frequency	Positive	44	59	64	63	62	62	60
	Neutral	32	27	28	25	27	26	27
	Negative	24	14	8	13	11	12	13

Table D-7 Opinion on Rail Service by Zone

		1	2	3	4	5	6	Total
Reliability	**Positive**	68	70	65	75	42	60	65
	Neutral	27	27	29	22	37	26	28
	Negative	5	3	5	3	21	13	8
Crowding	**Positive**	15	9	17	11	24	28	17
	Neutral	32	24	17	7	22	15	19
	Negative	53	67	66	81	54	57	65
Safety	**Positive**	29	37	48	65	47	52	48
	Neutral	39	34	32	24	31	31	31
	Negative	31	29	20	11	22	17	21
Convenience	**Positive**	55	66	76	78	66	76	71
	Neutral	34	27	21	19	27	18	24
	Negative	11	7	3	3	6	6	6
Frequency	**Positive**	72	78	79	87	70	80	79
	Neutral	21	19	19	10	23	16	18
	Negative	6	2	2	3	7	4	4